Water spectrum

issues · choices · actions

DEPARTMENT OF THE ARMY, CORPS OF ENGINEERS

Vol. 5, No. 3, 1973

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Published quarterly

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Use of funds for printing this quarterly publication was approved by the Director of the Office of Management and Budget on January 6, 1972, with approval to publish through December 31, 1976.

A major purpose of this publication is to serve as a written forum for the open discussion of issues and choices in resolving water resource problems. Views and conclusions expressed or implied do not necessarily reflect the position of the Corps of Engineers.

Subscription rate is $4.50 per year; $1.25 additional for foreign mailing. Price of a single copy is $1.25. Order directly from Superintendent of Documents, Government Printing Office, Washington, D.C. 20402

This issue developed by Policy and Analysis Division, Directorate of Civil Works.

Address changes: Please attach old address label to request for changes.

This account of the new Chief's career and other activities is primarily a selection of points directly or indirectly related to civil functions, particularly his interests in environmental matters.

The New Chief

When the new Chief of Engineers, Lt. Gen. William C. Gribble, Jr., was still a new lieutenant just out of West Point and had just acquired a new bride from his home town, the prospect of his some day holding the Army's top engineer post was remote to say the least. You get the impression, though, that Mrs. Gribble, whose confidence in him is unwavering, wouldn't have been entirely overwhelmed at the idea.

They are both outdoors people, going back to when they grew up together on the upper peninsula of Michigan. There the forest lands, wild streams and Great Lakes held an open invitation to outdoor pursuits, and thus their early appreciation for the natural environment became a permanent affinity for both.

Later, during the years when their two daughters and two sons were at home, they lived in places like New Mexico and Alaska where tent camping, family outings and fishing offered, to them, the greatest outdoor appeal. Now that their youngest daughter has finished college, and General and Mrs. Gribble are on their own, he concentrates more on sport fishing and they have an occasional weekend at their cabin in the Blue Ridge foothills—leaving the tent pitching and back packing to other members of the family.

General Gribble's longstanding interest in environmental quality found another form of expression in his last assignment. As Chief of the Army's research and development, several of the many research projects dealt with the environmental problem of pollution control. One project sought to develop a cleaner engine exhaust emission, and

(Continued on inside back cover.)

The change of command from retiring Lt. Gen. F.J. Clarke, left, to Lt. Gen. W.C. Gribble, Jr.

COVER: Control of ports and water transportation varies from country to country and city to city. Management at Venice is under an autonomous agency. See page 27.

Every Chief of Engineers inherits the changed conditions that occurred during the tenure of his predecessor and, in addition, faces impending changes that await him.

What General Clarke felt about such changes during his four years in the office were discussed with Water Spectrum just before he retired to other ventures.

He presided over the Corps during an era of re-examination and new direction, and we asked him which of these changes during that period has had the greatest effect on the Corps' civil works activities.

ell, the most clearly evident is the environmental legislation that passed during the four years. Actually it had cast a shadow before them. The discussions that had taken place in the 60s indicated that the environmental views of the people were probably going to

A TENURE OF CHANGE

by Lt. Gen. F. J. Clarke

be expressed in legislation. We were a little forewarned on it. In fact, we had already started on a few of our projects to make some very careful steps toward giving greater consideration to environmental matters; but the real impetus came when the National Environmental Policy Act (NEPA) was passed, late in '69.

I think we are meeting all the requirements, although I am sure there are some who would disagree. As I see NEPA it is a kind of full disclosure act, trying to come up with an honest evaluation of what the environmental effects of a project might be, and make an honest search for alternatives. By and large, we are doing that, particularly on new projects.

The difficulties that we've had are not so much for the new projects, but the old ones, some of which were conceived in the 30s. We are just now executing them and we have found ourselves in a very difficult position, particularly in projects that were underway. To be honest, there probably is something of a built-in bias to continue them to completion, but several court cases have made us go back and examine these again. All of these have been re-examined in detail, such as the Gillham Dam and other projects.

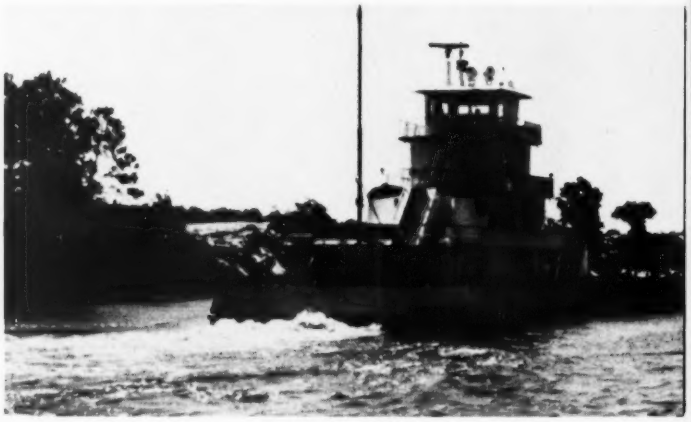
We get ourselves—when I say "we" here I mean the "country" gets itself in a peculiar position which is not unique to the Corps. We find, particularly with public utilities and the energy field, that the people are really speaking with two voices. They state they want a decrease in growth or a stopping of growth. By their actions, which speak louder than words in many cases, you find they are demanding greater energy or greater use of water resources. This makes it difficult for an administrator to decide exactly what to do. He can see the trends that are exemplified by the actions of the people and he can hear what they're saying and the two don't necessarily say the same things. It puts us in the unpopular position of trying to interpret trends and then find that there is a great deal of emotionalism involved which carries over into the political field. People are not always willing to accept the idea that they have to pay for what they are getting or what they will need.

We have some good examples of this in our business. The drought of the mid-60s in the Northeast has pretty well faded from the memories of most of the people, except the memories of those who are working on the problem of how do you avoid it the next time. The solutions that are being studied, and the various alternative plans—none of these are acceptable to the entire population. There is still this general feeling: well, go ahead and come up with the solution, but don't put it in my backyard.

Public Participation

I would hope that with open planning and exposing of all alternatives that the public at large would see that there are only so many ways in which a problem can be solved. I would hope that we could get the public to look at solutions objectively and reach the best consensus but I am not certain this is working out as yet. The public hearings are a part of this program of exposing alternatives. Actually, I think much of the productive work is done in small working sessions with small groups from environmental organizations and representative public officials.

We have come a long way from the old idea that we had 20 years ago, of going for the least cost solution. I believe—I know—it is accepted within the Congress. I think it is gaining acceptance in the Office of Management and Budget that as long as you have a solution which still makes sense from a benefit-cost basis, it



doesn't necessarily have to be the least cost solution. It should be the one that finds the greatest acceptance throughout the country. This is a change in our whole national approach to some of these problems. We've been thrashing for years with the idea of *who* pays for the environmental niceties. I don't think we're asking that question so much any more, although we haven't resolved all the issues in that area. The first question we are all trying to find the answer to is what are the essential environmental considerations that must be incorporated in the project.

We are going to find that we will establish the policies by precedent—once we get enough projects behind us where we have developed a pattern of adding the environmental cost just as we add the costs of pouring concrete, and then allocate these costs, more or less in the traditional ways. People will accept this procedure and it will become a policy. I am a great believer in the fact that many of our policies come *not* out of people sitting down and writing out words, but out of finding a solution that is acceptable; and then, after you have done that about half a dozen times, suddenly this is policy.

User Fees

The principle espoused by the National Water Commission on user fees is a trend that has also been

espoused by the Office of Management and Budget, for at least the decade that I have been around here, trying to find more ways by which the beneficiaries pay more of the cost and the public at large pays less.

I don't know. We have two opinions in this country, either one of which could be supported. As I say, the National Water Commission reflects the views of the Office of Management and Budget or at least those of the old Bureau of the Budget—regardless of which Administration is in power. On the other side of the coin, the Congress has generally felt that where the benefits were generally pretty widespread, the public at large should pay for them and, by and large, the benefits would spread themselves throughout the country.

I suppose the classic case under consideration is on the use of the waterways—whether the operators pay for them. I think business on the waterways is sufficiently competitive among the various haulers that the margin of profit is not excessive, at least the financial statements that I have seen would not indicate that it is.

So the costs obviously are going to have to be passed on to the consumer. Then you get into the question of competition with railroads, and the state of the railroads, and this leads into all kinds of economic questions.

In the National Water Commission report we see all kinds of suggestions for further cost sharing—in the area of flood control in particular. I have a little difficulty with that myself when I consider some of these major flood control systems that we have. I can see how it could work with the little local project that protects a town to be sure the water goes through it in a hurry. But when you look at something as comprehensive as the whole Mississippi system, and it really does add up to a system, I can't see any way on something that grand a scale except for the public at large to pay for it, for the overall social and economic well being of the country. You can bring this concept on down into the smaller systems that we have, and can build a real good case with the public at large paying for it.

I am sure this is going to be debated in the Congress. We have already seen signs of it with various Congressmen and committees speaking out, expressing their views. They particularly don't like the cost sharing suggested by the National Water Commission.

Flood Plains

I don't think you are going to stop people from moving into the flood plain because they are threatened by a flood. They move in and then after they are damaged, they scream. They may learn a lesson that way, but I think the solution has to come through local zoning control and, hopefully, through State land use planning.

Land Use

A land use act is bound to have a considerable impact because out of it will come better plans. For in most cases there will be some plans that will be adopted, where none exist today, to control the uses along the land sides of the rivers. I suspect much of the payoff will come in the form of an environmental bonus. I don't think we will find that there will be any diminution in the amount of industry or the amount of residential use of property along the rivers. It will just be clustered into more sensible groupings rather than having it all intermixed the way it is now. You will find existing green belts preserved.

Any consideration of land use automatically leads into where you would like things in place, so that industrial views or uses are in one place, and residential space in others. It is going to be a very difficult thing to accomplish, but I wouldn't discourage it on that basis. It seems like a sensible program. We should start on it and eventually see what comes up.

Department of Energy and Natural Resources

I have just been reading the draft legislation sent over to the Congress. Actually it doesn't really change the Corps' role too much from what we have done in the past, except that we would look to the Secretary of DENR and his staff for the type of guidance which we have been earnestly seeking in the past and have been receiving to some degree from the Office of Management and Budget.

I suspect we probably still would be doing some of the Level A and Level B planning as the agent of the river basin commissions or of DENR simply because we have the competence to do it. I think some good could well result from the Secretary of DENR looking at our budget in conjunction with the Soil Conservation Service and the types of projects the Bureau of Reclamation has, looking at them altogether. It may make a more sensible package of water resource development than we have had, although OMB has done a pretty good job of looking at these in the past.

But so far as project planning, engineering and design, construction, operation, maintenance—we would have

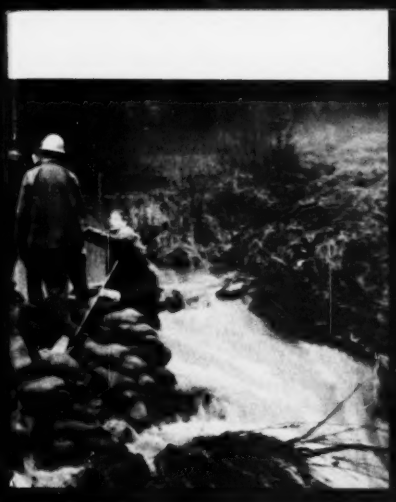
the same roles we have had. The one area that we would lose is the permits—what we call Section 10 permits for structures in navigable waters. I have mixed emotions about losing that. I think we have a great deal of knowledge of the waterways with particular respect to the physical effects of these structures, and I think we probably still should be commenting on permit applications with respect to the question: Does it in truth interfere with the navigable waterway?

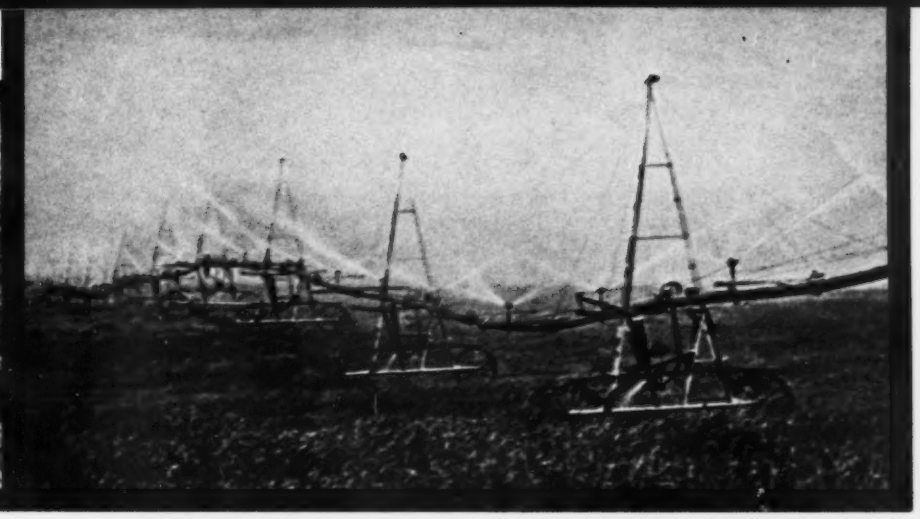
On the other side of the coin, the environmental aspects are now becoming paramount. They are very difficult to evaluate because there are so many things involved, and this is where my emotions get mixed as to whether we should give that up or retain it. Under the proposed legislation it would go to the Department of Energy and Natural Resources. How they would handle it, I don't know—it would take a sizeable organization and they could well delegate it back to us to act for them on it. The Board of Engineers for Rivers and Harbors would go to the Secretary of the new department, and of course that Board has been a wonderful help to the Chief of Engineers over the past 70 years or so, evaluating projects from a very objective point of view. The Chief of Engineers will still have to have some comparable review board to be certain he is getting the right advice from his District and Division Engineers.

Wastewater Management

The one place where land treatment falls down is the political acceptability. I still think it is as good an alternative as we thought it was in the beginning. What we really needed was about a 20-year program to go through pilot studies, demonstration, and let the word spread more or less on its own. It's obvious that you can't force this kind of a program down the throats of people who don't want it—you've got to have the people who are concerned to be convinced that there are plusses that exceed the disadvantages, and have them naturally ask for the program. We've been engaged in the studies about two years, and this is just not a long enough period to get the word around as to what the advantages of land treatment might be, particularly to the very concerned people whose land might be considered for the disposal sites.

There are, as you know, numerous examples. But I still think it should be offered to the people in the region





as an alternative. If the people of the country are serious and want what is in Public Law 92-500, which is essentially that they want "no discharge" of pollutants into the waterways, this is a very attractive solution from the economic, engineering, environmental point of view, but not from a political point of view at the present time.

Water Quality Goals

Whether water quality goals are realistic is a debatable question. The National Water Commission has just come out with this very, very strong position that they are probably not realistic and not required. I think it bears a lot of examination. As a matter of fact, if you look at the law that was passed, 92-500, Congress put section 315 in there, which said these goals should be studied and reported on to Congress by 1975. In a way it is open ended and I think Congress was wise in putting in this study requirement and in setting up a National Study Commission in this law to do it.

I keep watching these curves as to how much you pay for the last 1 percent of pollutants to be removed, and it concerns me as to whether the public at large is really willing to pay. I think an absolute "no discharge" policy is unattainable in our lifetimes. On the other hand, we ought to do our best, but let's do it sensibly. Let's not shut off the U. S. in order to accomplish it.

D. C. Water Supply

It is just as critical today as it was 10 years ago when I served as one of the three D. C. Commissioners. Bloomington Reservoir is now under construction. Aside from that, in essence, nothing has been done. As a matter of fact, the situation is probably a little bit more critical because in the intervening years, Maryland has put another pipeline into the river to draw about 100 million gallons a day. Fairfax County, Va. is planning to put an intake in the river for 32 million gallons a day, possibly going up to 48 later. I keep remembering—in 1966 and then again in 1969—when the flow of the river at one time was less than the peak demand during that summer. That was basically from the Washington water intakes. So add another 150 million gallons coming out above the Washington intakes and the problem becomes more acute.

The Baltimore District and the North Atlantic Division have been looking at the alternative of using the estuary as an emergency source, but the Public Health people are always very concerned about the effects of the viruses in this water. If we get the pumping system in we could count on the estuary as an emergency source of

50 million gallons a day for 30 days. We are talking in that order of magnitude, anyway. We have asked Congress for authority to build a pilot plant and see if we can't do something about the virus condition, and make a little better use of the estuary for emergencies, but my personal feeling is that we are headed the wrong way. That is a high cost solution, whereas some degree of storage up the river ends up with a lower cost and a higher quality of water.

Corps Projects

I tell my environmental friends that the word has gotten down and obviously our people are working the way we intend them to work—trying to find out what it is that the public wants. It has been very heartening.

I recall our early days with the Environmental Advisory Board when I asked them to please keep in mind that we were a large organization. We had 30,000 people working all across the country and that you couldn't get them all marching in the same direction overnight. But if they would give us a little time and help us work on the systems that we should be employing and in the exposure of all alternatives, meetings with interest groups, and all, I thought they would begin to see some progress. They have, of course, and they have been very complimentary of the work that the Corps has done.

I do have a feeling that in some areas we are probably leading in consideration of environmental matters and we get recognition from a great many groups. I am certain that we do not want ever to be in the role where we are the leaders in environmental matters to the exclusion of all the other things that we should be considering. As I see it, we are still in the Corps project business which is to produce a solution which is technically correct, economically justifiable, environmentally sound, and which the public is willing to back.

Actually for all the headlines that we have had on environmental matters, they really have touched only a small number of our projects which are underway. I am sure we have had discussions on many, many of them but we have been taken to court only on about two dozen. We have been slowed up on some of that two dozen and probably have made more careful studies as a result. At the moment we are stopped temporarily only on five, but that number changes from day to day, and I anticipate that by the time we do some more studying and come up with new conclusions, and then come up with some alterations, we may well go ahead on those. A couple of them are pretty tough—the Cache River project, for example—but it is awaiting action by the Congress on mitigation rights. So the only one that we are really stopped on at the moment is the one that the President has stopped. On the others I have hopes that we will eventually reach an accommodation and be permitted to go ahead.

Hindsight

People have asked the question: what would not have been built today had all this concern for the environment been in effect over the many years? It is very difficult to think of any project that probably would not have been built. There might have been a few differences. The ports would have been developed around the country. We might have put our dredge spoils somewhere else. The main navigation channels would have been developed, and I think the major flood control projects would all have gone in. We probably would have given a little more tender care to some of the estuaries and I suspect we would have probably tried to do more in the way of mitigation and enhancement than we have done on some of the projects, but I still think the basic projects would have been built.

The Decades Ahead

We have got to finish the Ohio River System, which means we are talking of over $1 billion. After the floods on the Mississippi it is obvious we not only have got to repair, but we have to go in and do a lot more work that was a part of the original plan, and it behooves us to do it as quickly as possible. There is at least $2 billion more required to finish the Mississippi River System. The Tennessee-Tombigbee is underway—that's $500 million. The Mississippi-Illinois Waterway modernization is coming along—another $500 million to a billion dollars. Add in the additional power units in the Columbia River System—that's up in the hundreds of millions. Quite a bit of work is yet to be done in flood control, particularly where the suburbs have grown out into areas where they are subject to flash floods. Maybe they shouldn't have gone there under proper flood plain management, but they are already there and they have to be protected.

The trend in worldwide ocean commerce is to deeper draft vessels, and that doesn't mean just the big tankers. That means some of the harbors of the U.S. have got to be deepened. There's a tremendous program there.

Flood control moves from crisis to crisis. The Susquehanna is getting a great deal of emphasis right now because of Agnes last year. As the next storm comes and we get a flood some place else, programs that have been moving very slowly will accelerate and we will find demands for projects that have been on the shelves for years.

Just to finish the projects that we have on the books is going to take something like $16 billion, and there are a lot more things coming along. I see a very active program. Someone has got to do it and I think the Corps will be called on to do it.

It has intrigued me over the past four years, particularly the last couple, to be approached by what I would call the environmental group saying: the Corps has changed from its traditional way of doing things. I am always glad to hear this, of course, because I think it means that they recognize we are doing what we are supposed to do. I also try to tell them that it isn't the Corps that has changed, it is the fact that the public has changed in its views of what it wants. We are trying to do what we have always tried to do, which is to give the public what it wants. You can trace this through evolution of the Corps. As new purposes were added we expanded our horizons.■

LAND USE

A utility company realizes the necessity of constructing another power generation facility to meet increasing demands. It selects a site which seems to meet its requirements.

A zoning variance is required because the site is in a semi-rural, agricultural area. The utility applies to the local zoning commission. The commission members are inclined to grant the zone change because it will provide more jobs, a larger tax base, better schools.

But the local residents raise a hue and cry. The old-timers have watched the neighboring metropolis sprawl: destroying the pastoral landscape, and bringing all manner of urban problems with it, from crime to air pollution. The newer residents moved here to escape those problems, to begin again. Beginning again does not mean making the same mistakes. They know, from experience, that a single, clean power plant isn't the end of things. With it will come: increased needs for transportation; industry seeking a new source of energy, and so on—the cycle of new growth.

Meanwhile, the "environmental" groups, urban and rural citizens, have joined the fray because: the site is one-half mile from a proposed park; or, the thermal waste of the plant will flow into a prime fish spawning ground, or.... But the zoning commission is not persuaded by these arguments. So it grants the necessary variances and permits.

The "environmental" groups file suit on the basis of environmental considerations. The local residents file suit because it lowers residential property values—who wants to live next to a power plant?—and they aren't speculating, either.

The whole thing gets tied up in court, and drags on. Polarization increases, as arguments become more vehement.

Meanwhile, power cutbacks are necessary because of a shortage of marketable energy.

What is wrong with this story? Why is it repeated endlessly, throughout the country, and not only for siting of power plants, but also: amusement parks, new towns, low-cost housing, industrial plants, in fact, any development at all? Rather suddenly, citizens *don't want* to attract new residents to their area. They *don't want* "development" of their remaining land.

They are challenging the traditional notion that unfettered growth is good. They are challenging it because, though our individual standard of living has steadily increased—our gross material wealth—the collective quality of our environment is going down.

The "new mood" of the American people is best expressed by the common platform of four successful candidates of a recent Dade County, Florida, election: "the more people who come to share the good life, the less good it becomes."[1]

It is not progress, nor growth, that is so dissatisfying to many people. Rather, *it is the way we have grown:* like Topsy, unplanned, sprawled over the landscape—without regard for people's needs, or the natural environment.

The zoning variance experience, described above, is a generic description of what our "planning" has become. But this isn't planning, in any sense of the word. This decision-making "process" is based on reaction, instead of positive action. By positive action, I mean determining the course and goals of future growth, and guiding development towards attaining those goals.

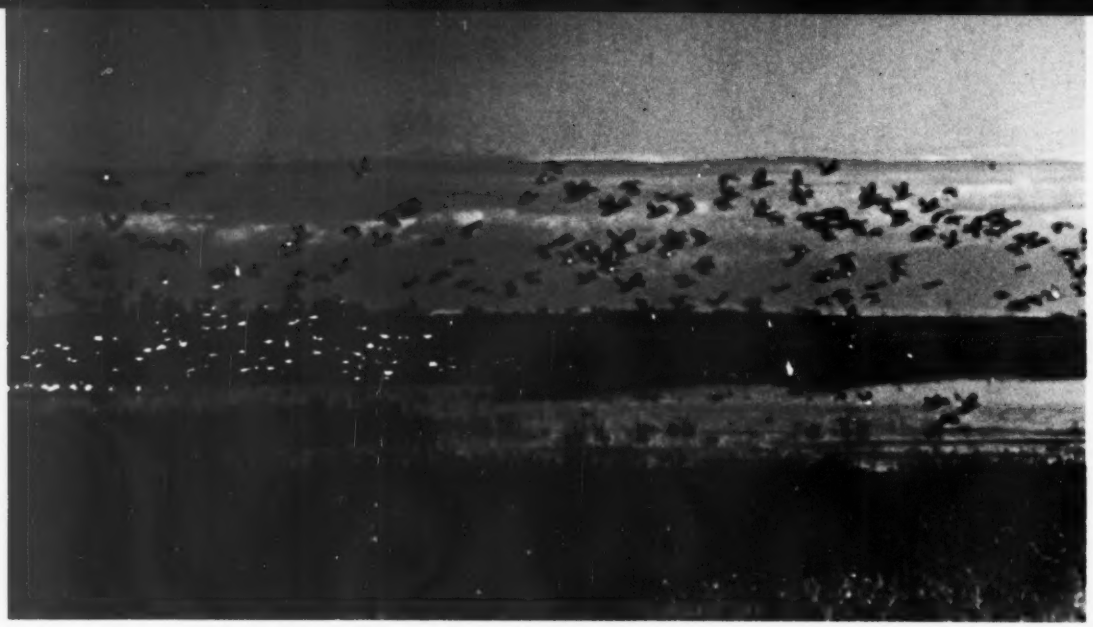
The short-term considerations on which such judgments are made—the immediate monetary benefits—are too often the primary motivation for such siting or development. Realizing the long-term impact on our environment may well lead to different decisions.

All this was hardly apparent a few years ago in a land which seemingly knew no boundaries. But lately we began to realize that our vast land is being "used up." Prime land for agriculture or recreation is paved over with suburban monotony. Land where people want to live and work is being wasted mercilessly: the landscape scarred irrevocably, the air polluted, and the water fouled.

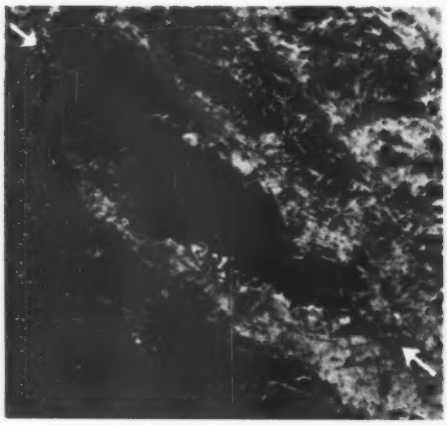
It is estimated that over the next 30 years—by the end of this century—we will have converted 28,000 square miles *additional* undeveloped land to urban uses. This is

[1] *Use of the Land, A Citizen's Policy Guide to Urban Growth:* Task Force on Land Use and Urban Growth, Thomas Crowell Company, New York, 1973.

by Lance Marston Director, Office of Land Use and Water Planning, Department of the Interior



Wetlands represent a type of critical environmental area that is irreplaceable.



This satellite image of the San Francisco Bay area indicates the intensity of development (in blue) along the underlying San Andreas fault line (between arrows), an area of high seismic risk.

Right-Solutions to coastal land use problems are often regional in nature.

Power plant siting may be a development of regional benefit or an intrusion into a critical natural environmental area of nationwide significance.

an area equal to the total areas of the States of New Hampshire, Vermont, Massachusetts and Rhode Island.

Court litigation and cries of "no more growth" are the results of a mounting public frustration and anger. We need only look around us to see that too many of our land use decisions have been unwise—that they have been based on short-term expediency, and resolution by pressure or crisis, rather than by long-range formulation of goals. In our growing, it has come time to take physical and social—as well as economic—factors into account if we truly desire to protect and enhance our environment.

The original land use regulatory authority of local governments derives from the constitutional "police powers" vested in the State. This power was delegated to local jurisdictions by the zoning enabling acts of the 20s. Zoning's main purpose was to prohibit "incompatible uses" and protect property values. Those objectives, based on the conditions of that era, seemed appropriate.

The focus of zoning is purely local. But there are over 10,000 units of government which engage in zoning; and in urban regions, their borders are directly adjacent to each other. Clearly, this sort of piecemeal governmental machinery is inadequate to deal with regional concerns. It is insufficient to meet the needs of diverse constituencies, or to promote resolution of complex problems.

If we re-examine the scenario described at the outset of this article, we find that there was no disciplined and rational process to identify the conflicting forces, and determine an optimal regional solution for what was clearly a regional problem. The local jurisdiction which was trying to grapple with the situation was too small, and did not possess the necessary administrative or technical resources and expertise to resolve the problem. *Alternatives* could not be identified, because it did not have the technical capability; and it could not administer a decision on other potential sites, anyway, because it lacked the jurisdictional authority.

What is the solution? Local units of government have banded together in regional councils. These provide a forum for discussion. Coordination of efforts can be obtained. Planning on a regional basis is often undertaken. But their weakness is their lack of authority. They can't implement planning; their planning is only advisory. It is only by common agreement among local governments that regional planning is implemented, which too often represents the lowest common denominator.

Some response has occurred at the State level. Recognizing the problems of regional land use decision making, several State governments have begun to reassert their authority and responsibility in this area. Hawaii led the field by instituting statewide planning and zoning in the last decade.

Other States, such as Maine, Vermont, and Florida, have concentrated on identifying areas of State concern, and planning and regulating land use according to recently enacted legislation in such areas as wetlands, floodplains, and agricultural areas. The key to success of any of these efforts, however, has not been by taking power away from local governments—but by working in partnership with them to identify and resolve regional and State issues and, most importantly, to implement their decisions.

A national land use policy and planning assistance program would further assist and encourage these efforts. Through such assistance, financial and technical resources could be provided to the States to develop land use planning and regulatory programs in four major areas.

Planning and regulation of *critical environmental areas* would protect unique and irreplaceable natural and cultural areas of regional, statewide and national significance: historical sites, wetlands, prime agricultural areas. It could also insure that special care is taken in developing areas which are prone to natural hazards—areas of high seismic risk or floodplain areas, for example, or areas which are most valuable to man if they are maintained as viable natural systems, such as aquifer recharge areas.

Regulate growth around *areas of key facilities.* Key facilities mean airports, highway interchanges, and other public investments which are growth-inducing. These are often in areas which do not yet have the local governmental machinery necessary to insure that, as public facilities, they solve problems instead of creating new ones.

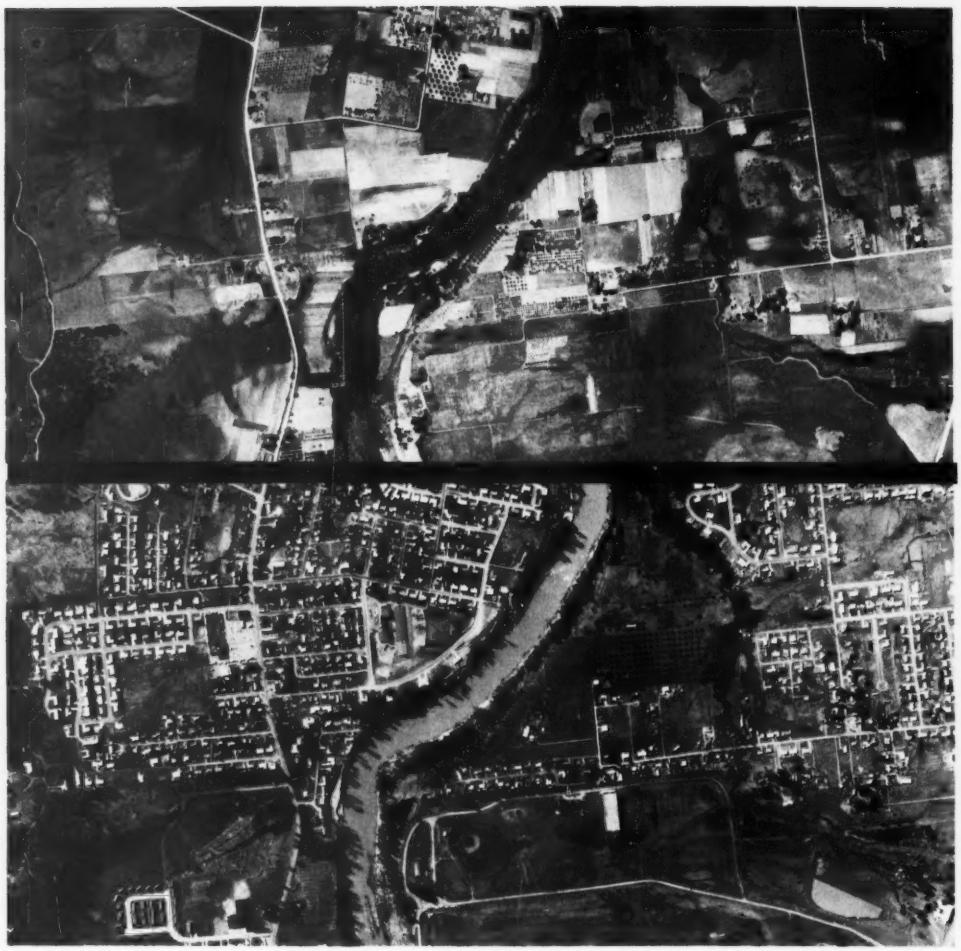
Control land use and development of regional benefit. Such developments could include siting of energy facilities, waste disposal sites, or new communities; or, in urban areas especially, insuring that an adequate supply of housing exists in all price ranges, and that local governments do not exclude such developments.

Finally, regulate *areas of large-scale development,* such as large-scale subdivisions. States should have broad discretion in defining the extent of these areas.

In planning and regulating land uses, the type of program needed would encourage the States to use their planning capability and regulatory mechanisms already in existence to the greatest extent feasible. In fact, to do otherwise would not permit timely and effective implementation. Moreover, the purpose should *not* be to establish a massive new central planning and management function at the State level. It should *not* "take away" the important functions which are served by local governments. For they can best understand the problems of their own constituencies, because they are closest to them.

In those four major areas of State concern—areas of critical environmental concern, areas around key public facilities, areas confronted by large-scale development of regional impact and areas developed for regional benefit—the State could fulfill its responsibilities either by doing its own planning and regulation, or by administrative review of local level planning and decision-making.

National land use legislation would significantly impact the Federal, State, and local roles in land use planning and decision-making. It could be expected to create a partnership which would utilize the resources of



A quarter of a century's land use changes illustrate the extent of encroachment onto the flood plain between 1939 (top) and 1965 in these aerials of an expanding West Coast community.

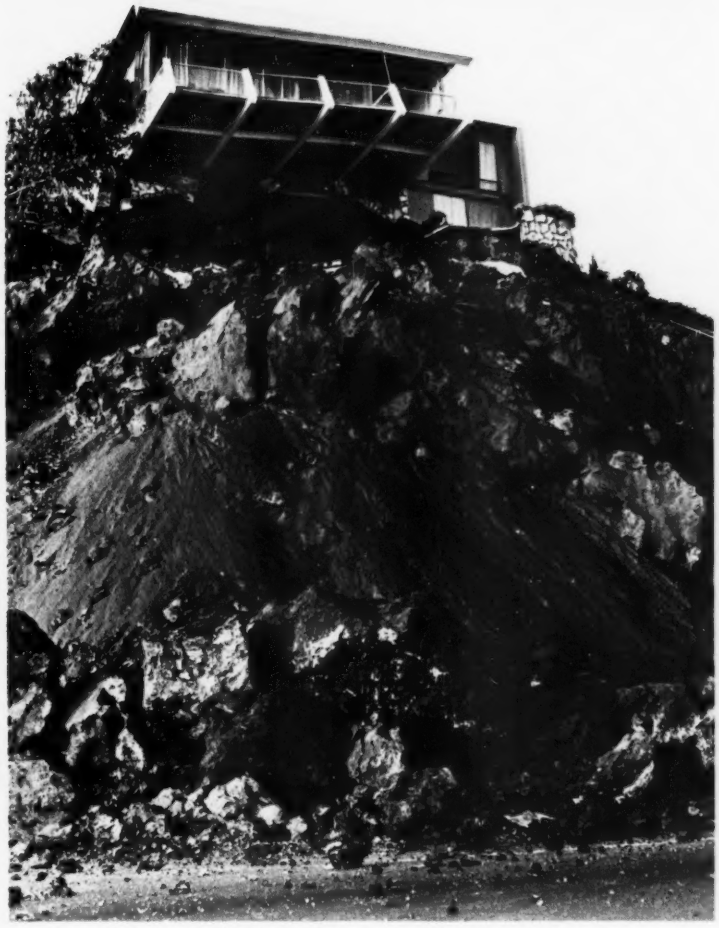
all levels of government to create the new institutional mechanisms required to guide future growth.

To us, at the Federal level, there are two impacts of major significance. First, the resources of the Federal Government should be redeployed, away from Washington. Over the years, a tremendous technical talent has accumulated here in Washington, in the Department of the Interior and other Federal agencies. We can use that expertise to assist the States in developing their own planning capability.

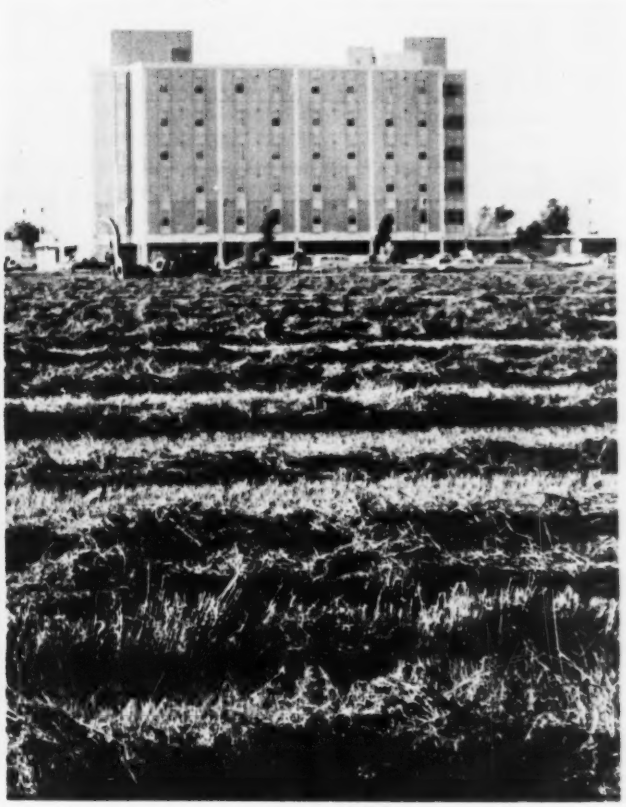
The second, and more far-reaching impact, will be that the Federal Government will have to "put its own house in order." Federal programs and projects must be consistent with State land use programs. Federal programs have for too long, and too often, ignored State and local needs and desires. Yet massive Federal projects have tremendous impact on the surrounding land uses. There are vast areas of public lands in the Western States that play a crucial role in relation to any national land use program. Planning for the use of these public lands can no longer disregard neighboring uses. Conversely, in areas which are set aside for national benefit—such as national parks and wildlife refuges—neighboring private land use must not adversely affect these areas either.

For the States, the national programs should mandate new roles and responsibilities for State government. They would have to reassert their responsibilities in areas of State concern. Additionally, the intent of the program should include State development of comprehensive and explicit policies toward land use within its own boundaries. Through a careful examination of alternatives and consequences—future scenarios, if you will—the State's citizens would be able to determine the positive direction of future growth. Considerable public education and participation should be mandated as part of the program, and it would be the responsibility of State and local government to develop policies towards land use through open and forthright public discussion and debate. It is only in this way that potential conflicts can be identified and resolved, before they reach crisis proportions. In this way also, the overriding issues facing us—development of a strategy for urban growth, for example—can be effectively dealt with.

For local governments, a planning policy at the national level would mark the beginning of a new, progressive, State-local relationship. It should reassert the important role that the local governments must play in resolving local issues, and identifying local desires toward regional decision-making. The State program would complement existing local planning, and ensure coordination among local jurisdictions. Regional decisions, such as described at the outset of this article, would be made by identifying the full range of public in-



Over 10,000 local units of government engage in zoning, each having unique problems.



Over the next 30 years an estimated 28,000 square miles of additional land will be converted to urban uses.

terests—including environmental protection and enhancement—and balancing them. Local governments must share responsibility for facilities such as sewage or power plants and regional recreation. An adequate choice and opportunity must be available for all citizens in terms of housing and employment.

A national land use planning assistance policy is the vehicle we have so desperately needed to grapple with the forces affecting our environment. To date, single-purpose legislation has given us some of the tools we need; but mostly, it has given us the breathing space we need to create long-range solutions. Proponents of national land use legislation have termed it "linchpin" legislation because it ties together planning programs at the State and Federal level, and would assist the States in drawing together their single-purpose, fragmented planning functions. It would provide an opportunity for Federal, State and local governments to redefine their respective roles in land use planning, and work together to formulate long-range solutions to our environmental problems.

As Senator Jackson so well described it:

> "It is essential that we develop a framework within which the myriad proposals to use or consume natural resources can be balanced against one another . . . we need a focal point upon which we can compare alternative proposals to achieve our goals . . . that focal point . . . should be the use of our land."

We in the Department of the Interior believe that the challenge of this decade is rooted in the land, and in our ability to identify ways to insure that the fragmented and conflicting "planning solutions" of the past are not continued. This is not a challenge based on short-term gains for a single cause or Federal agency, but rather, it represents an integral part of a series of much-needed institutional reforms dedicated to bringing government closer to the people.

President Nixon is committed to making government more responsive to its constituency. He recently said that "it is our responsibility to reform our government institutions, so that the new spirit of the American people can be nurtured."

An important part of this "new spirit" is the growing conservation ethic: that all environmental—social, physical and economic—factors be considered in the planning and decision-making process.

Public scepticism about the ability of government to respond to problems is not baseless. Too often government operates by reaction or inaction, and wastes human and natural resources.

Land use planning reform by itself is no panacea, but it represents a building block to avoid the mistakes of the past. A national land use program would represent a significant milestone in determining our future.■

"WE OF THE INDUSTRIAL AGE BOAST OF OUR CONTROL OVER NATURE. PLANT OR ANIMAL, STAR OR ATOM, WIND OR RIVER—THERE IS NO FORCE IN EARTH OR SKY WHICH WE WILL NOT SHORTLY HARNESS TO BUILD THE 'GOOD LIFE' FOR OURSELVES.

BUT WHAT IS THE 'GOOD LIFE'? IS ALL THIS GLUT OF POWER TO BE USED FOR ONLY BREAD AND BUTTER ENDS? MAN CANNOT LIVE BY BREAD, OR FORDS, ALONE. ARE WE TOO POOR IN PURSE OR SPIRIT TO APPLY SOME OF IT TO KEEP THE LAND PLEASANT TO SEE, AND GOOD TO LIVE IN?" *Aldo Leopold, June 1932.*

estuaries under attack

by William Q. Wick,
Head, Marine Advisory Program
Oregon State University Extension Service

Estuaries are under attack by mankind. Most of the world's largest cities are built on them. The bulk of the world's waterborne commerce begins and ends in estuaries.

Although *estuary* stems from the Latin word meaning *tidal,* today's definition refers to a semi-enclosed body of water having a free connection with the open sea and within which sea water is measurably diluted with fresh waters from the land.

Such calm and cautious words to describe a dynamo!

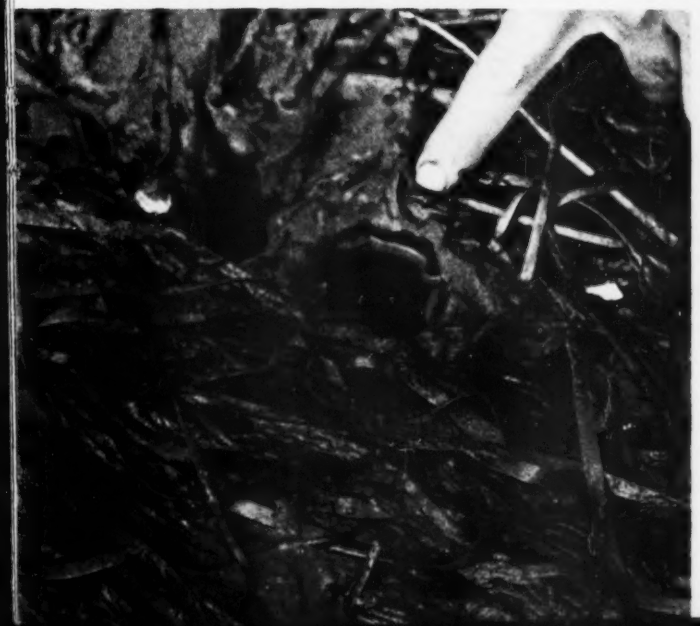
The definition gives not the slightest hint of the presence of major cities (Tokyo, London, Shanghai, New York, Buenos Aires, Osaka and Los Angeles) nor the vast volume of waterborne commerce. Nor does the definition encompass an apparent race to demolish the world's estuaries by "reclaiming" them or polluting them or indicate that these waters of many uses may be the most productive natural areas on earth.

The world's estuaries seem to be disappearing in quantum jumps—under dirt and concrete and bitumen and water and mountains and crud. Move a mountain in Kobe. Plan key-type housing in New Zealand. Expand an airport in Tokyo, Hong Kong or Coos Bay. Dike an estuary for fresh water in Macao. Gone. Gone. Gone. Perhaps God didn't make enough estuarine acres—or He made them too well.

In the *good old days,* whatever they were, there were no apparent problems in the estuaries. Plenty of resources; plenty of estuaries. The ocean was large, a convenient open sewer. Need a dock? Build one. Need some land? *Reclaim* it from the sea. Navigate and motivate. Stimulate some commerce. Not too long ago, reclamation of *useless* land—including marshes, tide flats, and deserts—for *useful* purposes ranked right up there with apple pie and cleanliness as the all-American way.

The problem is the value conflict over our estuaries. A pertinent example is the ambivalent attitude toward our Pacific Coast, where only a handful of bays permit seagoing ships the opportunity to load and unload in a safe harbor. Obviously, these bays must be used for commerce. So why not fill in the estuaries to create docks and channelize to supertanker depths? We may stand to lose a few opportunities to dig clams, which

A mussel farmer in Marlborough Sounds, New Zealand, pioneers a new marine farming enterprise, hinting at the tremendous quantities of protein food the world's estuaries can produce.



some people feel is shovel-by-shovel destruction of an estuary anyway.

Frankly, the "eco-nuts" seem to be polluting the job environment. Tell me how much an acre of bay is worth as a public resource, and I'll buy it from you. Simplistically, perhaps we should make a dollar-and-cents choice between fish and people. Evidence from The Netherlands indicates that reclaiming the Ijsselmeer by walling out the sea resulted in a destruction of animal life but a vast increase in total human values.

Yet environmental concern has some dollars-and-cents aspects, also. Bays, for example, provide open spaces for air drainage. This air-sea interface cleanses the atmosphere, reducing smog. Smog costs money. It interferes with our resources, fish and clams—a priceless perpetual crop—over the centuries. Almost too late came the awakening of environmental concern and understanding of estuaries. But the concern of environmentalists to save everything can be as destructive as the determination to industrialize everything. Must business as usual cease until we learn what makes an estuary tick?

The impact of man as an estuarine predator is easy to document because man is a square animal. Look at some close-up maps of the world's harbors and you find ample examples of our right-angle tendencies. Where else on earth can you discover similar evidence of intensive development and use? Big cities? Fine! But remember that many of the largest are built on *filled* estuaries.

How can the concern about continuing destruction of estuaries be communicated? Scream. Yell *Crisis*! Everyone reacts to the word *Crisis*! Stir up the people. Create

Happiness on Umpqua Bay: A cushion of soft mud to kneel on, a soft-shelled clam at the bottom of the hole.

Friendly finger points out reality of local adage: By their holes you shall know them. Round dimple in this bed of eel grass shows presence of a Gopher clam. The grass provides shelter and stabilization for clam beds.

an emotional confrontation. Stop everything. Stop *reclaiming* the estuaries. Stop shipping. Stop docks. Stop eating. Starve.

Classic. No middle ground. Either you're for estuaries or against them. Either you're an industrialist or you're a conservationist—or worse yet, an environmentalist. Never give a centimeter. Pass some laws.

There are, potentially, more environmentalists than industrialists. Both can be dead wrong in their attitudes on constructive use of the world's estuarine resources. Unfortunately, the chain of commerce from an oil tanker unloading at Anacortes to a station wagon on a Wichita freeway is a straight line. There is cause and effect. Stop a ship in Washington. Stop a car in Kansas.

Whether you choose to participate or not, the environmental-industrial confrontation, of which estuarine management is a part, affects all of us. Basically, it is a good confrontation. Eugene Cronin, in the 1967 American Association for the Advancement of Science book, pointed out that "Man's past effects on estuaries have been poorly and incompletely planned, unimaginative, and frequently destructive. In view of the many important uses served by these waters, and the size of the growing pressures on them, it is imperative that a new major human force be utilized in the future—the force of intelligent management."

A Plan-it-Yourself Estuary Kit

There is another way: the optimistic and positive approach of intelligent management through planning and zoning. All of us can play a part in stimulating economic growth through wise development of estuarine industrial resources and at the same time protect the natural resources.

Yes, it is a difficult assignment. Those of us who construct the plan operate with limited facts. We confront opposition from both environmental activists who want everything to cease and commercial interests whose goal may be to squeeze the last buck out of a public resource. We are sometimes appalled by public apathy. But the public individual must fend off a staggering volume of demands for his attention. We must be clever to capture his attention.

Every resource, interest, and commodity seems to have at least one agency at local, State, regional, and Federal levels responsible individually or collectively for any problem that might arise. Further, many agencies change names with each administration, and a scorecard is sometimes useful to identify the players. Most agencies are helpful and determined to complete their appointed duties in an efficient, carefully prescribed way. Few of them are innovative; many are conservative. With minor exceptions, agency administrators and employees are talented, helpful, and hard working. Some agencies are blamed for the collective sins of society; others are praised for decisions which they may never have made.

When our plans are finished and the appropriate zoning proposed, we may stand accused of interfering with private rights on public lands and waters. But the several years of effort are worth the time and money—because essential economic development is fostered through an estuarine blueprint which also provides for protection of the natural resource base.

Natural resource interactions are complex. The estuarine resource is particularly complex because of the continually changing mix of fresh and salt waters, temperature changes, currents, etc. In a vast oversimplification, I suggest that the five qualities which follow are crucial to biological productivity in estuaries. Perhaps this could be titled the *Fisheries Bill of Rights.*

Good water quality must be maintained. An estuary is not a sewer. The saltwater-freshwater mix will vary naturally with the tide and season. Sediment loads and natural turbidity will fluctuate. Water quality is dependent on uses both within the estuary and through the entire watershed. Reduction of freshwater flow through irrigation, for instance, can cause major estuarine problems. The only important question on water quality is: Can all life states of the organisms which use the estuary for birth, a nursery, life, shelter, or a transportation corridor thrive in the temperature-nutrient-salinity-chemical mix of the waters? The answer does not necessarily dictate a return to the pristine estuary. Maybe addition of some nutrients enhances water quality. Sterility, however, produces nothing.

The water-flow pattern of an estuary must not be materially altered. Channels, fills, and other alterative changes should complement the flow system that has developed during the aging of the estuary.

An estuary should not be filled. A filled estuary is a city street, a runway, a pier, but no longer an estuary. Compromise may be necessary, however.

Primary food energy (plankton producing) areas must be protected if we're to go on eating. These are usually the shallow tidelands—the bay areas most susceptible to reclamation.

Freedom from harassment is also an estuarine environmental quality. Estuarine organisms can be used intensively but must have periods of rest. The alternating tides provide rest for clams and other tideflat dwellers. Birds and mammals that use the surface also need periods of freedom.

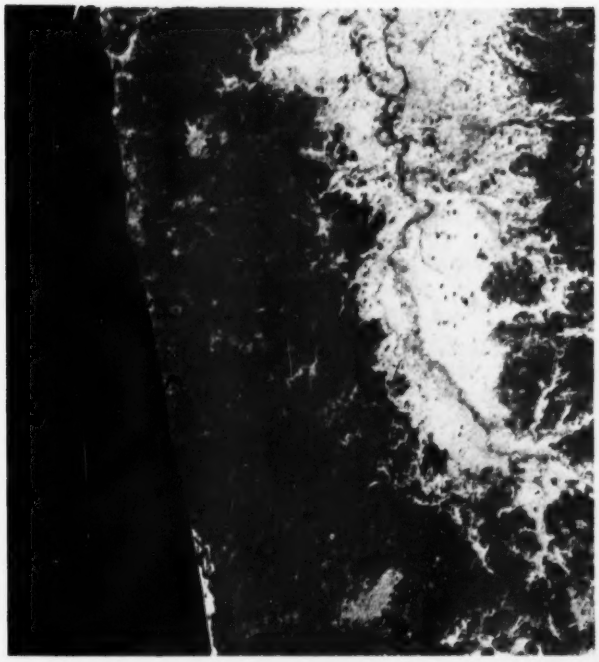
The list could go on, but we're trying to keep things simple.

Commercial-Industrial-Human Uses

Clams, fish and plankton aren't the only organisms that have basic rights. Humans have needs, too. We've considered some estuarine qualities essential for fish and other aquatic organisms. Now let's look at some of the human-associated uses of coastal bays.

Maritime shipping requires large docks, back-up storage facilities, stabilized deep-water channels, turning basins, and a safe all-weather bar.

Commercial fisheries need unloading docks, adjacency to processing facilities, drydock and other ship repair,



Left-Pacific Coast estuarine acreage is so limited that the minute blue coastal indentations of Oregon represent 1/10th of 1% of the State. (NASA Photo)

Although commercial fishing in estuaries is important, it represents only one of many essential uses.

Man is a square animal! Estuarine alterations for square-shaped boat basins require dredging and filling, and create dead water areas—all adversely affecting the natural flow system.

In Yaquina Bay, where some efforts have been made to tailor manmade alterations to the flow pattern, one of Oregon's best clam digging areas was created accidentally around the breakwater at top center.

fuel, ice and other supplies, staging areas for gear storage and repair, docks for boat parking, and a safe bar access to the ocean.

Recreational hunting, fishing and boating uses of the estuary require boat docks, launching areas, fuel, parking for automobiles and other amenities.

A home along the bay is desired by many people. What could be nicer on a warm day than a sea breeze and the opportunity to dangle a hook from your own private dock?

Many other commercial-industrial human uses of estuaries could be listed. Each use may develop into a point of conflict over environmental versus economic uses. The key is to find points of mutually compatible compromise on both sides.

It is probably a safe bet that most counties, cities, port districts, to say nothing of States or regional bodies, have a number of plans on file for almost all contingencies. Take, for instance, the several feet high stack of plans one Oregon coastal port manager pointed to as his port district's developmental guides. Such planning efforts often *end* with delivery of the printed plan. However, the documents may have been prepared only as a requirement to establish a district's eligibility for funds under some Federal or State act. After suitable fanfare and presentation of copies to local politicians and others who might have a professional or personal interest, the dust-gathering process starts. The plan becomes an artifact—a monument. It can be pointed to and cited as—"Yes, we have completed our plan and thus are eligible, etc." Is this a good enough reason to spend thousands of dollars for planning? It is little wonder that proposals to establish a new planning effort are often met by silence or, worse, unconcealed groans.

Our estuary plan must therefore be a living, moving process. To do this, it must be constructed by the people which it affects. Laws are made in the capitols of the world. Life is lived where the people are—in this case, among the coastal estuaries.

In Oregon, citizens have played the principal role in the successful completion of estuary plans which have led to the zoning of land and water and implementation of both economic development and environmental protection projects. A pioneering effort occurred in Yaquina Bay, where a task Force appointed by the Lincoln County Commission in 1969 provided the leadership and dedication necessary to conduct the planning, zoning, and partial implementation.

Coastwide guidance in estuarine planning is provided by the Oregon Coastal Conservation and Development Commission (OCCDC) established by the 1971 State Legislature. Early in 1973, OCCDC compiled the ideas and experience of citizens and agencies in a bulletin entitled "Estuary Planning Guidelines." This step-by-step approach may be helpful in involving appropriate citizen and agency groups in the process of developing *our* plan rather than somebody else's version of what our plan should be.

Those who are commencing an estuary planning project may wish to review this publication. Included within the 36 pages are suggestions on stating and achieving objectives, the steps involved in problem identification and gathering information, analyzing alternative solutions, developing and adopting a plan, implementation and provisions for a periodic review, evaluation, and updating. The last step, *updating,* is particularly significant. A plan must be viewed as a continuing effort—a beginning, not an end.

Planning Participants

Local citizens, especially those having an interest or responsibility in the estuary, must participate in the planning process, or it won't work. This means representatives from the port districts, city councils, county boards of commissioners, and special districts. Add to this group active citizens from commercial, industrial, and environmental groups.

One method to structure the local planning effort is to have the County Board of Commissioners appoint an official task force. The task force prepares plans for review and implementation and serves as a catalyst and sounding board. To be effective, the task force must be assured that its findings will form the basis for a decision on estuarine planning, zoning and implementation.

An equally important group in the planning process is the technical advisory group (TAG) composed of local citizens with specialized talent, State and Federal agency representatives, university oceanographers, etc. The TAG is charged with compiling technical information pertinent to the planning effort. Most of the agencies represented will have designated management responsibilities within the estuarine zone. Thus, the agencies will be a *party to the estuarine plan,* rather than commenting on the plan *after the fact.* This is a slight but vital change of role. At times, members of TAG, because of their special talent and interest, may also become members of the task force.

A leader must be designated, someone to direct the overall planning effort. This may be the county planner or a hired consultant. Both methods have been successful. Project coordination must be a continuous process—a process which does not happen by chance. The project coordinator is responsible for critical-path scheduling, preparation of maps, meeting agendas, and many other duties.

Most planning projects, at some stage, will require the services of a specialized consultant perhaps to conduct a marketing study, or to provide some other valuable service. Carefully specify the objectives of the special project, the form in which the results are desired, the time frame—all in relation to available funds.

The most neglected segment of the estuarine planning team is the general public. A certain amount of apathy will be detected among this group until you try to do something. The public may tend to be reactive, or negative. Ingenuity and concerted effort are necessary to involve these *client* groups early in the planning effort. Perhaps a well-publicized hint that the steps which the task force is taking will affect industrial and recreational

uses, the environment, property values, and aesthetics—and lead to zoning changes—will provoke a response.

Everyone is in mortal danger. Move the task force meetings around, use the media, take field trips, involve service clubs. The interaction with the public is education at its best—both outward from the task force to the public and as feedback to the planners.

The final major group in the estuary planning scheme comprises the policy bodies who will take the preliminary land and water use plans, proposed zoning ordinances, and sample developmental projects and pronounce the proper benediction that converts a plan into action. These policy bodies at the local, district, State and Federal levels should review the estuarine plan at each step. The commitment to take action must come from these policy bodies.

The planning process which we have discussed is pretty standard. It will work. The results will be usable. But it takes some superior innovation to excel. One who has is the mayor of Auckland, New Zealand.

Sir Dove-Myer Robinson, KBE, has a well-earned reputation for the successful use of new ideas. Auckland is a city of estuaries and peninsulas. Garbage disposal is a problem. In some cities, garbage is used to reclaim estuarine land. To partially alleviate the garbage problem, Auckland's mayor established a composting program. All organics and tin cans are composted. Glass and plastics are separated. The composted material is sold back to the citizens for use in gardening. Further, Auckland's sewage treatment ponds produce tremendous quantities of green algae. An anticipated 100,000 pounds will be harvested for feed additives annually.

Let's discuss some other opportunities to dare to be futuristic.

Planning in the absence of data. Planning presumes the availability of a bank of hard data on biological stocks, historical uses, physical characteristics, etc. Facts are not available in some of these vital areas. But we can't wait. Make the necessary decisions on the basis of the best information—even if incomplete. Recognize that changes in the plan may be necessary when new data become available. The changes may cost money. Where information is not available, make the need known so that agencies and universities can work to develop it. As an example, Oregon State University, one of the Nation's first Sea Grant colleges, works closely with the people of the Oregon coast to provide useful information on biological and physical characteristics of Oregon bays. Further, the university is developing methods to measure the effects of changes in the economy and the environment. Hydrologic data, collected by ocean engineers at Oregon State, have already been used in planning for development and protection of Alsea, Siletz and Yaquina Bays.

Estuary renovation and revitalization. Accept the idea that estuaries are filling through natural sedimentation in a slow, dignified way. Here today and gone 20,000 years from now. Man's activities through abuse of the watershed, unsuitable logging practices, road construction, or natural catastrophies such as the forest fires in the Tillamook Burn, may age an estuary prematurely. What are the opportunities to restore a dying estuarine ecosystem through selective dredging or current manipulation? Practically no attention has been given to opportunities to restore an estuary that has been damaged. In Oregon, renovation and revitalization have been proposed for such estuaries as Tillamook, Nestucca, and Siletz Bays. A 1972 project by the U. S. Army Corps of Engineers in Tillamook Bay, which cleared the channels of the Wilson and Trask Rivers, may have successfully pioneered the concept of renovation. Large scale efforts are now needed.

Creative uses for dredge spoils. Most environmental interests accept the industrial necessity for dredging to provide navigation channels. The prime point of conflict concerns the disposal of spoils. Take a positive approach to spoil disposal. Work by the Corps of Engineers and North Carolina State University's Sea Grant Program has indicated that spoil islands, in various successional stages, are important to successful sea bird nesting in the Atlantic Flyway. Submersible spoil islands on the West Coast have become, without planning, some of the better clam-digging flats. Dredged sand is a crucial resource for beach replenishment in some areas. Can dredge spoils be land banked? Can spoils be strategically placed offshore to augment coastal sand transport? Can spoils be mixed with garbage to produce vegetable cropland?

Take a chance on compromises. But don't compromise on essentials. In the Yaquina Bay Plan, the task force determined that three shallow flats produced a major proportion of the primary food—as do shallow estuarine flats throughout the world. These areas were zoned for food production—not to be filled or altered. The task force also determined that ocean water entered the south side of the bay and returned to the sea in a counter clockwise fashion along the north edge of the estuary. The north side of the bay for two miles from the entrance upstream was selected for industrial development. Under the plan, essential fills are permissible in this northern segment.

Where alteration of the estuary is determined to be necessary, *shape the fill, channel, boat dock,* or *groin to fit the water flow pattern.* Does everything have to be square? Perhaps a teardrop-shaped alteration would blend with the flow—or even enhance the flow.

Let's look for some answers to these Second-Generation Estuarine-Planning Questions:

—We properly complain that too much valuable land is used for automobile parking. How many acres can be assigned to park boats?

—Aquaculture (farming the sea) is emerging, technically, from the simple pastoral culture stage. Racks, pens, floats, and other devices are required for modern culture. Is this a compatible use of estuarine surface area?

—Some forms of recreational boating—water skiing, for example—require large areas of water. Are these uses environmentally compatible?

Tillamook estuary has prematurely aged through man-caused and disaster-related sedimentation. Siltation choking of the system caused by forest fires in the watershed, questionable logging practices and other means is evident in the mouths of the Kilchis, Wilson, Trask and Tillamook Rivers at bottom. In 1952 a natural disaster broke the coastal spit, bringing sand-bearing flood waters into the bay. (Photo—Thomas J. Murray & Associates, Portland, Ore.)

—How far should we pursue the idea of "water-relatedness"? Is it desirable to enact shoreline-setback laws, such as are now in force in Hawaii and New Zealand, to move non-essential construction back from the water's edge?

—Is construction and use of a private boat dock, intruding on a river or estuary, the inherent right of any citizen?

Help in planning procedures and data are available from a wide variety of sources. Those Federal and State agencies with responsibilities in the coastal zone can provide information in the form of maps, biological and hydrologic data, climate, economic and historical data.

The recently passed, but as yet unfunded, Coastal Zone Management Act could provide major Federal impetus and support for estuarine planning efforts.

The Positive Approach

The estuarine environmental-industrial conflict of the past few years has put a crimp in the free-wheeling developmental style that many of us grew up with. A change was long overdue. There are ways to live with the change. We will all be better off. Finding the elusive, mutually beneficial planning and developmental compromises is a difficult task. Regardless of which way we may lean, we have spent most of our time nipping at our opponent's jugular rather than searching for answers. We have blamed our servants in the agencies for being unyielding in enforcing laws rather than helping them to develop realistic regulations. If our thinking has been commercially oriented, perhaps we have not realized that a clean, productive environment stimulates the economy. Conversely, thinking as environmentalists, we probably failed to realize that the hunting and fishing economy, which our policies would dictate, would support very few people. All of us have to eat.

Proper compromises create harmony. Man inspired changes must conform to nature's dynamics in the estuarine environment. The planning task is never easy. ■

MODEL FOR A STUDY

by Alfred E. Robinson, Jr. and James H. McKay

A simple groundbreaking ceremony for the Chesapeake Bay Hydraulic Model that took place at Matapeake, Maryland, this past June was the culmination of years of intense effort by many people interested in the future of Chesapeake Bay. When completed, the hydraulic model will provide the scientist, engineer, and water resource planner with one of the research tools necessary to both understand the bay and to develop a comprehensive management plan.

A silver shoveled groundbreaking at Matapeake, Md., starts off construction of the nine-acre hydraulic model of Chesapeake Bay. When completed, this largest estuarine model in the world will be housed under a shelter similar to the artist's rendition.

Construction of a model of Chesapeake Bay is no small task as the bay is one of the largest estuarine systems in the world, having a surface area of about 4,400 square miles and a length of approximately 195 miles. As is typical of coastal plain estuaries, Chesapeake Bay is a broad, shallow expanse of water varying from 4 to 30 miles in width and having an average depth of less than 28 feet. The over 50 tributary rivers feeding freshwater into it drain an area in excess of 64,000 square miles. Each of these rivers has its own geochemical-hydrologic characteristics. The largest of these, the Susquehanna, provides over 50 percent of the freshwater inflow.

The ebb and flood of the tides are the most readily perceptible water movements in the bay, even though the mean tidal fluctuation is small, generally between one and two feet. Superimposed on the tidal currents in the bay and its tributaries is a non-tidal, two-layered circulatory pattern. One produces a net seaward flow in the upper layers of the bay, the other a flow up the estuary in the deeper layers. These layers are predominantly a function of the variation in salinities—which range from 35 parts per thousand at the bay's mouth to near zero at the north end of the bay and the heads of tributary embayments. In fact, the salinity variations constitute the most significant physical parameter influencing the circulatory dynamics of the estuary.

The physical and chemical dynamics of Chesapeake Bay make it biologically a very special place. Its 7,300 miles of shoreline and immense wetland areas and shallows provide not only food but also a sheltered nursery area for larval and juvenile animal forms. Salinity variations within the bay encourage colonization by

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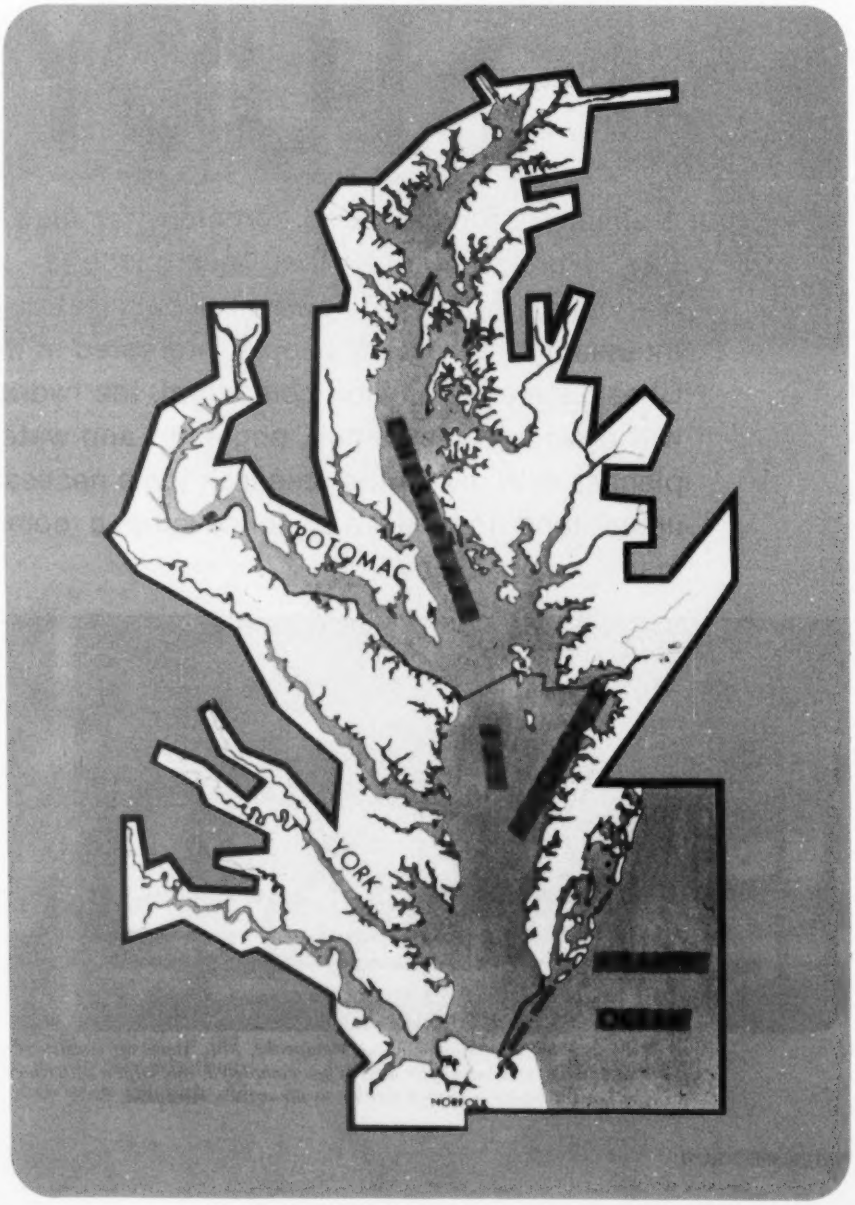
Mr. Robinson is Chief, Chesapeake Bay Study Group, Baltimore Engineer District. Dr. McKay is Chief, Technical Studies and Data Development Section of the Group.



Approximate limits of the area being reproduced in miniature are superimposed on this boundary map.

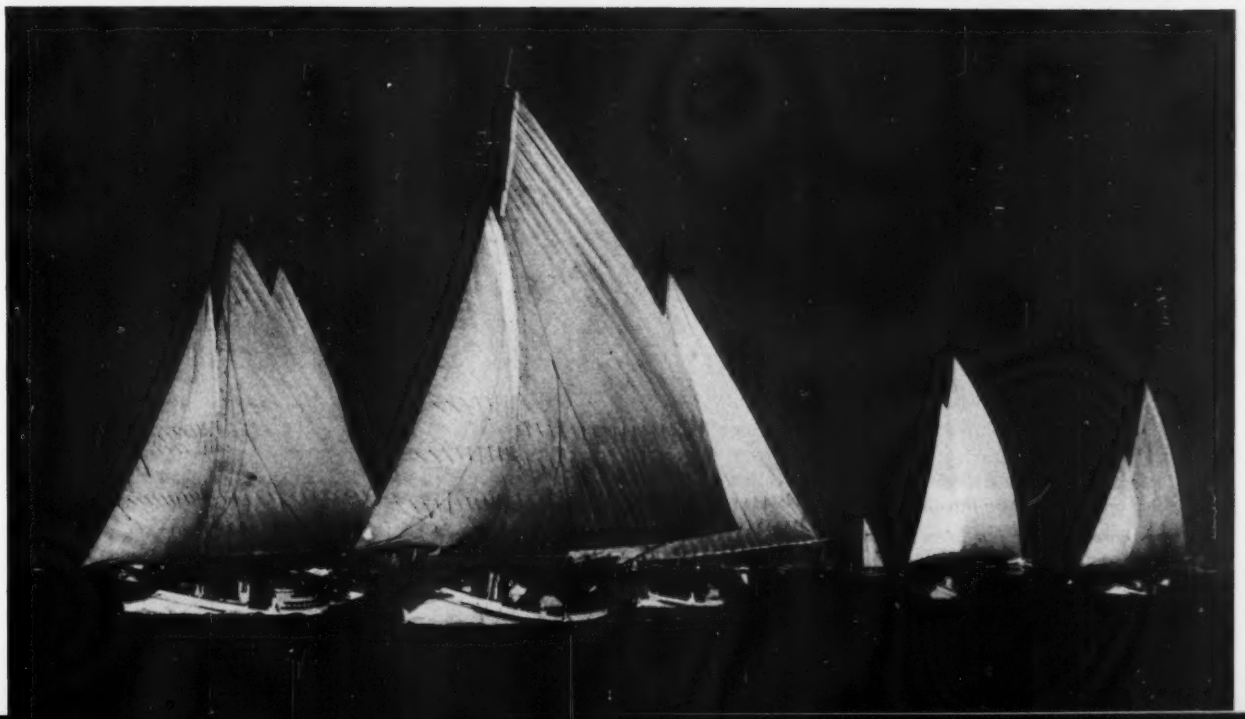
aquatic organisms of both fresh and saltwater origin. The bay's crop of both fin and shell fish is legendary. The most important economically are the soft-shelled clams, oysters, blue crabs, menhaden, and rock fish. Most of the 239 recorded species are permanent residents, but many ocean spawners also use the bay—as a nursery for their young.

Man settled early along the bay's shores, first the Indian tribes and later the colonists for nearly the same reasons, food and transportation. Colonists in particular were dependent upon the Chesapeake for a means of travel, not only as an access to the ocean and the motherland, but to other settlements along the bay and into the hinterlands. And the bay's importance as a means of travel has not diminished with time. Through the romantic clipper ship and side wheeler era, an increasing number of boats have dotted its waters. The clipper and side wheeler are gone now, replaced by today's large ocean-going freighters and tankers, and, even more evident, over 125,000 pleasure boats.

As the sea-going commerce grew, so did its attendant ports. Norfolk, Newport News, and Hampton Roads (at its mouth), Richmond (at its middle), and Baltimore (on the headwaters), were all a product of this growth. Baltimore alone handled over 24 million tons of foreign cargo valued at $2 billion in 1971.

Transportation, however, is by no means the only way that man benefits from the bay. Thousands of commercial fishermen earn their livelihood harvesting a variety of fin fish, oysters, clams, and crabs, while still others process these gastronomical delicacies so that

Commercial fishermen with nets and oyster tongs are common to the bay, indicating the importance of the seafood industry to the region's inhabitants. Chesapeake fishermen also rely on the fast vanishing "bugeye" and "skipjack" sailboats unique to the bay.



Wind and wave action threatens existing property by eroding the shoreline.

Top-Foreign trade has been instrumental in building commercial centers on the bay such as that adjoining Baltimore Harbor. (Port of Baltimore Photo)

Oil spills continue to be one of the major environmental concerns in Chesapeake Bay.

they may be enjoyed throughout the region and the Nation. Millions of people flock to its shores for such pleasurable activities as boating, fishing, swimming, water skiing, picnicking, or just a few minutes of relaxation. Tourists from all over the country visit the origin of their heritage in such historic places as Williamsburg, Annapolis, and the Nation's Capital, Washington, D.C. Great cities and industries have located along its shore—located there because of the great abundance of water or because of the Chesapeake's effectiveness in assimilating their wastes.

Chesapeake Bay, however, is beginning to feel the effects of both the intrusion of man and natural forces. Its upper reaches are sometimes covered with algae—algae caused by human, agricultural, and industrial wastes. Great electrical power plants are being planned and constructed, and who knows what effects the heated discharges will have on the biota. The forces of wind and waves are gradually eroding the shoreline, and islands which were once there have disappeared. Man, in building his great urban society, has denuded the land to such an extent that it readily erodes; and soil is carried by rainwater to the bay, where it settles to the bottom. Lastly, in his quest to accommodate the ever increasing numbers of people, man has begun to fill and destroy the bay's environmentally invaluable wetlands.

How far can man continue to use the bay without causing irreparable damage? This was the question facing the Baltimore District Engineer when, in October 1965, Congress directed the Corps of Engineers to make a complete investigation and study of water utilization and control of the Chesapeake Bay Basin, and to construct, operate, and maintain in the State of Maryland a hydraulic model of Chesapeake Bay.

The bay's problems are perplexingly complex and their solution requires the expertise found in many different disciplines. No single entity could be expected to have the requisite personnel, equipment, and technical know-how necessary to accomplish this comprehensive investigation by itself. Such expertise does exist, however, among the many agencies which have been historically responsible for certain features of water resource development. The Chesapeake Bay Study is, therefore, conceived as a coordinated partnership between Federal and State agencies and interested educational institutions. Consequently, an elaborate coordination mechanism was established which provided for an Advisory Group to provide the Baltimore District Engineer with broad guidance, a Steering Committee to keep him abreast of technological advances, and five Task Groups to function as basic work groups. Through this mechanism, constant liaison, work review, and requisite agency interaction is being maintained between the various participating agencies.

All of these people are working toward a common goal—a management plan which will provide guidelines on how the numerous, but limited resources of the bay can best be used while still maintaining its beauty, dignity, and life system. It will take many hours of effort to achieve this. The Chesapeake's capacity to support activities of all types must be assessed and the future demands expected to be put upon it must be determined. And most important of all, the optimum level and mix of activities must be determined and framed in the context of a viable, flexible plan of action.

These decisions, however, can only be made if we understand the bay; understand what it is and what makes it that way. This is a tremendous task, a task that can only be achieved through the use of tools which reduce the bay to an understandable and manageable scale. Such a tool will be the hydraulic model of Chesapeake Bay.

The use of models in studying hydraulic problems is by no means a new concept. It is an evolutionary outgrowth of many centuries of applied and theoretical engineering studies. Although very little has come down to us about the knowledge of the movement of water possessed by the ancients, it is well recognized that the hydraulic arts were practiced before the dawn of recorded history. The Americas, Europe, Asia, and Africa all contain samples of early significant hydraulic works.

Lake Moeris was constructed about 4,000 years ago to store flood waters of the Nile. Twenty-five hundred years ago a navigation canal, which the present Suez

Canal closely follows, connected the Red Sea with the Mediterranean. Significant flood protection works were constructed 4,000 years ago by the Emperor Wu, an outstanding Chinese hydraulic engineer. The Roman Senate considered cutting through a river bend of the Tiber that threatened Rome, and one of the greatest geniuses of all times, Leonardo da Vinci, built the first chambered navigation locks in the world near Milan 500 years ago.

Most early hydrologic researchers used laboratory equipment with which they attempted to model natural hydraulic phenomena. It was not until 1875 that the French engineer Farque applied hydraulic modeling techniques to solve a problem arising from actual engineering practice. The second attempt to use a hydraulic model for an operating problem took place in England in 1885 when Professor Osborne Reynolds built the first estuarine model to study the effects of proposed works on the Mersey River Estuary.

Reynolds' Mersey model was built with a horizontal scale of 1 to 31,800 and a vertical scale of 1 to 960. Tidal cycles with one minute periods were generated by a water-filled, hand-operated, hinged pan at the ocean end of the model. The construction of this model represented a definite advance in that it was the first time a time factor was introduced into a hydraulic model study. Because of Reynolds' study, the proposed works on the Mersey Estuary were extensively revised. Reynolds also called attention to the fact that hydraulic models had potential for use in pollution studies.

Since the time of Reynolds, the types of studies performed with estuarine models have been continuously expanding. Within the past 40 years, many important techniques have been developed that have made these tools much more versatile and reliable. Of primary value has been the realization that the density phenomenon plays an important role in estuarine processes. This led to reproduction of this phenomenon by introducing saltwater into the model through a model ocean and freshwater through simulated fluvial inflows.

Another development of great importance has been the use of thin metal strips cast into the concrete bottom as a means of providing artificial resistance to the flow of water. These strips are adjusted until they cause the same degree of roughness caused by the natural bottom of the real bay. This made possible, for the first time, model studies of wastewater dispersion and diffusion which Reynolds had envisioned years before. The refinement of these necessary techniques by the Corps of Engineers' Waterways Experiment Station (WES) at Vicksburg, Mississippi, eventually fulfilled Reynolds' predictions regarding the usefulness of hydraulic models for pollution studies.

Today, hydraulic models are much larger and more sophisticated than those used by the early pioneers such as Reynolds. Their very construction and successful operation are a significant engineering accomplishment. In fact, the effective use of a hydraulic model requires a complete integration of many scientific and engineering skills including those of the hydraulic engineer, hydrologist, oceanographer, and field surveyor to name a few. This is particularly true of the nine-acre indoor Chesapeake Bay Hydraulic Model which, when completed, will be the largest estuarine model in the world. This model will encompass the bay proper, all of its tributaries up to the head of tidal effects, and the adjacent overbank areas to an elevation of 20 feet above mean sea level. Also included will be the Chesapeake and Delaware Canal and a portion of Delaware Bay.

Preserving the beauty and dignity of Chesapeake Bay includes awareness of the respective roles played by historic Fort McHenry and waterborne commerce near Baltimore Harbor. (Port of Baltimore Photo)

The design of the hydraulic model of Chesapeake Bay is being carried out at WES. This work involves extensive hydrologic and hydraulic studies to size the hydraulic components of the model water supply system and to establish water requirements for the various operating modes. Included in the design work on a prototype of the model are careful topographic studies to develop the data from which the templates used to mold the model are plotted. Approximately 26 miles of templates will be placed during the model construction phase. Also, intense study is being devoted to the design of a system to control the generation of tides in the model ocean and control the freshwater that simulates river inflows into the estuarine system.

As previously stated, the bay conforms to the typical form of coastal plain estuaries, which are generally broad, shallow water bodies. The average depth of Chesapeake Bay lies between 25 and 28 feet. If the model were to be constructed to a reasonable natural scale, water depths in certain areas would be extremely shallow. Because of this, not only would the water be too shallow to make meaningful measurements, but the effects of water surface tension would disturb model test results.

To overcome these problems, the bay model, like almost all estuary models, will be geometrically distorted. This means that it will be constructed disproportionately by using larger linear scales for vertical dimensions than those used for its horizontal dimensions. The degree of distortion, as well as the actual scales selected, is dependent on many factors including the size of the area that must be reproduced and the problems to be investigated.

The Chesapeake Bay Model, therefore, will be constructed with scales of 1 to 1,000 horizontally but only 1 to 100 vertically. This combination of scales is referred to as a distortion ratio of 10. This particular scale ratio has been found, over many years of experience, to provide the most economically sized model that will accurately reproduce the vertical and lateral distributions of current velocity, salinity, and tidal elevation. The model's geometric scales also determine its time scale. A 12-hour and 25-minute tidal cycle can be reproduced by the model in approximately 7.5 minutes. This compressed time scale allows a one year testing period to be reproduced in the model in a little over three and one half days.

An extensive prototype data collection program was initiated concurrently with the design phase. This involved the collection of data concerning tidal elevations, tidal current velocity, and salinity at various points throughout the bay system. Tidal elevation data are being collected at 72 locations for at least one year's duration by the National Ocean Survey, which also conducted a 1,000 mile survey to establish a common reference datum for the tidal stations. Current velocity and salinity data were acquired at 105 different stations in the estuarine system for periods ranging from three to five days. This work was accomplished under contract with John Hopkins University, the University of Maryland, and the Virginia Institute of Marine Science. These data were collected to provide a valid basis for verifying that the model's hydraulic and salinity phenomena will be in acceptable agreement with the prototype.

The problems encountered in coastal or estuarine areas very often reflect the accelerating urban development and the population, industrial, and transportation base necessary to support this type of development. These are manifested in needs for improved navigational facilities, expanded water supply and wastewater disposal facilities, and increased energy requirements. These requirements—some of which cause physi-

So-called "reclamation" of estuarine wetlands alters hydraulic patterns and aquatic habitats within the bay.

cal and related biological changes—will be studied with the aid of the model by comparing the results of tests reflecting the existing regime with those reflecting changed conditions.

The problems that arise from navigation improvements, for example, are many and challenging. First of all, channels must be dredged and this poses the problem of spoil material disposal. For when dredged materials are deposited overboard, spoil *may* return to the channel and add to maintenance problems and costs. Also, the fraction of this material which remains in suspension causes turbidity, thereby displacing biological processes. Increasing channel dimensions may also permit saline water to penetrate farther upstream than had previously been possible. This, in turn, may cause heavier shoaling, a shift in shoaling location, or biological damage. Finally, the presence of navigation channels close to shore may increase shoreline erosion because of the greater effects of wave action. As an aid in studying transport of sediments and shoaling patterns, "Gilsonite" (a finely ground or pelletized plastic) will be used to indicate the percentage distribution of sediments and areas of scour.

Another problem that can have serious consequences is reducing the quantities of freshwater entering Chesapeake Bay. Among other things, this could alter the salinity regime and other physical characteristics of the bay, thereby creating an adverse environment for the propagation of aquatic life. These freshwater reductions could occur in many ways—including extensive droughts, interbasin transfers of water from tributary streams, and extensive groundwater mining. The hydraulic model can be used to monitor these changes and to develop plans for mitigating their effects.

Possibly the most damaging aspect of man's presence is the large volume of untreated or partially treated wastes that he discharges into the bay. Hydraulic model studies, through the use of dye injections, will be useful in determining the flushing characteristics of both the bay proper and its tributary embayments. At the same time, model studies will help in locating wastewater outfalls where the least damage will be done. Further, where the discharge of particularly deleterious municipal or industrial wastes, radioactive wastes, or significant oil spills, is a distinct possibility, the model will be used to look at the possibilities for the translocation of the wastes through the Chesapeake Bay system.

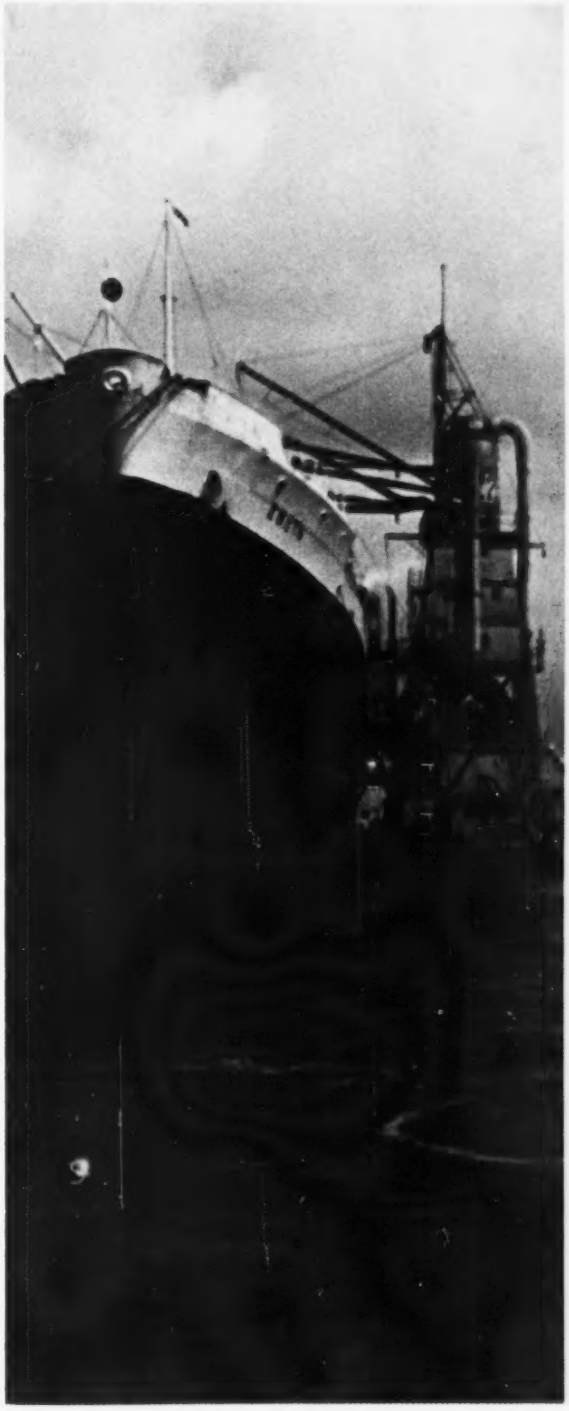
Unrestricted use of the Nation's waters for the dissipation of waste heat is as dangerous as the discharge of the more obvious domestic and industrial wastes. The large generating capacity of contemplated thermal power plants is forcing public utilities operators to look to the estuaries to meet the increasing demand for cooling waters. Because little actually is known about heat discharges, hydraulic model studies are important in preselecting plant sites, determining changes in the hydraulic regime caused by plant construction activities, and estimating the resulting temperature changes.

The process of land-filling and reclamation, besides having the potential of being ecologically unsound, can also cause changes in estuarine hydraulics. If the water area is significantly reduced, the existing current regime and tidal regime can be altered, reducing the bay's capacity to assimilate waste and flush itself. Here again, the hydraulic model will prove valuable in assessing the practicability and long-term effects of land-fill operations.

The current systems, tides, and water quality of Chesapeake Bay are complex and highly variable over time and space. When the works of man are superimposed on a regimen controlled by astronomic, meteorological, and hydrologic forces that are as yet incompletely defined, it is immediately evident that even the most geometrically uncomplicated estuary is a most difficult water body to understand. These difficulties are compounded many times over by an estuarine system as complicated and extensive as Chesapeake Bay. The hydraulic model, used in conjunction with both analytical and field studies, will greatly assist water resource planners in developing the management program required to maintain the beauty and dignity of Chesapeake Bay. The task will be both exacting and exciting.■

PORT DEVELOPMENT in the European Economic Community

by Drs. J.M.C. Hagenaar
Deputy Managing Director, Port of Rotterdam



On January 1, 1973, the original European Economic Community (EEC) of six countries (German Federal Republic, France, Italy, Belgium, Netherlands and Luxembourg) was enlarged by the entry of the United Kingdom, Ireland and Denmark. As is known, the primary aim of the EEC Treaty is to ensure by common action the economic and social progress of the member countries. Over the years, these nine countries have gained vast experience in the field of sea traffic and inland transport. As ports are the 'turntables' between sea traffic and inland transport, it would be logical to expect that inland transport as well as sea transport and ports would receive a great deal of attention in the EEC Treaty.

However, this is not the case. Title IV of Part Two of the EEC Treaty primarily relates to transportation by rail, road and inland waterway, i.e. to inland transport. Only at the end of this title, namely in the second paragraph of Article 84, sea and air transport are mentioned in the sense that the Council may unanimously decide whether, to what extent and by what procedure appropriate provisions shall be made in respect of sea and air transport. The EEC Treaty makes no mention whatsoever of ports.

The activities of different EEC bodies in recent years show definitely that they are aware that a Common Seaport Policy (whatever nature or form it may have) is essential in the long run. The Seifriz report, followed by the Seefeld report, the activities of the advisory committee on transport affairs, the European Parliament itself and particularly the recent activities of the EEC Commission point to the efforts made towards a Common Seaport Policy. On November 21, 1972, the Commission invited representatives of the major EEC ports to meet and discuss the subject. During this meeting it was announced that similar hearings would be held with representatives of employers and trade unions in the ports.

Before going into the efforts towards a Common Seaport Policy, an attempt will be made to survey a number of factors which play an important role for the member states which have great seaport interests. Without doubt some of these factors affect the standpoint taken by the individual member states in formulating a Common Seaport Policy. Moreover, it would seem desirable, in view of the historical finality of a number of factors, to place them in a general historical framework. In an approach of this kind, the philosophy of the individual member states concerning seaport development shows to fuller advantage. The differences in legal and administrative structures of the ports can also be made clearer in this way. There is, however, one disadvantage in this method.

A bulk cargo transhipment point.

A transatlantic container terminal.

The large differences in the various 'building blocks' which must inevitably be used, can complicate the resulting 'port mosaic'.

The EEC 'Port Mosaic'

If we restrict the 'port mosaic' to the member states France, United Kingdom, Netherlands, Belgium, West Germany and Italy, we can regard the three former countries as belonging to the category of 'old states' and the three latter as 'young states'. This alone is enough to make one expect considerable differences in administrative traditions and structures. But if we add the large differences in the history of these states, then we have all the ingredients for a very colorful EEC 'port mosaic'. Yet it is necessary to harmonize this motley colorscheme in such a way that the new 'Common mosaic' will provide a functional and therefore more attractive picture than the totality of the individual 'building blocks' attributed by the different member states. Only then can one speak of a contribution to the European Economic Community.

If we look at the six countries in the order they have been mentioned above, the following general picture arises:

France

A country which by virtue of its long history has become accustomed to a strong central authority and a closed economic system. It is the country which has produced such concepts as 'mercantilism', 'colbertism' and 'continental system', which concepts no longer fit into an Economic Community. Against this background a system of economic planning, effectuated by means of five-year plans for development and modernization, is not at all surprising. It is also logical for France to regard seaport development in general as an essential part in promoting the national economy, and to consider in particular the seaports as centers for regional development. With great sense of reality the French have taken care of the establishment of a centralized port administration and a decentralized system of port management on the one hand while, on the other, care has been taken that efforts are not dispersed over too many regional development centers simultaneously. In the sixth five-year plan development is clearly concentrated on Le Havre/Antifer, Marseilles/Fos and Dunkirk. This does not mean, however, that other port areas are being neglected.

The above-mentioned seaport policy was endorsed by the Act of June 29, 1965 (effective as from January 1, 1966), under which the regime of the major seaports was revised. The ports of Dunkirk, Rouen, Nantes—St. Nazaire and Marseilles, which were jointly supervised by the local chambers of commerce and the State, and those of Le Havre and Bordeaux, which were managed by a State-owned enterprise on a 'regie' basis were turned into State institutions responsible to the Minister, the so-called *'Ports Autonomes'*.

The essence of the Act of June 29, 1965, can be summarized as follows:
(1) centralization of investment decisions for the benefit of infrastructure by means of five-year plans; (2) decen-

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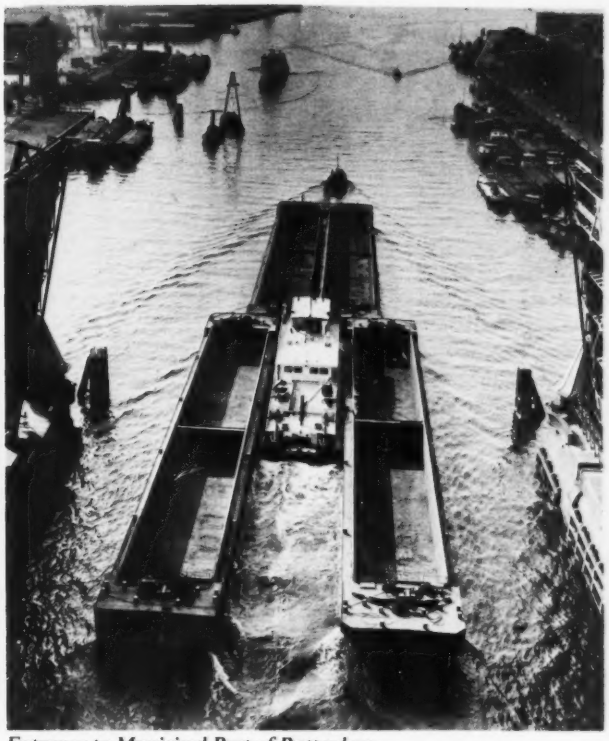
Previous articles have discussed a range of economic, engineering, environmental and other considerations which the U.S. and other nations face in harbor and port planning. This article, as another in the series, summarizes conditions that affect such planning in six Common Market countries, and is reprinted here with permission from the quarterly publication of the Rotterdam Port Authority.



Entrance to Municipal Port of Rotterdam.

tralization of decisions concerning management and exploitation of the ports; (3) a Port Autonome has a certain area under its control.

The Ports Autonomes must adapt themselves in good time to the developments of sea transport and must develop themselves into industrial centers. All the other ports in France are so-called Ports de l'Etat under central management.

United Kingdom

A country which at a very early stage put restrictions on central (Royal) authority (1215: Magna Charta, which became the basis of the later parliamentary system).

The Dutch Stadtholder William III too, when he acceded to the English throne, had to accept a regulation concerning the relationship between King and Parliament (1689: Declaration of Rights). In a historical framework of this kind one can expect to find very complex ownership and administrative structures. This is so in fact, as is clear from the following survey:

1 'Nationally Owned Ports'
These are managed by three governmental bodies:
(a) *British Transport Docks Board* [Barry, Cardiff, Newport, Port Talbot and Swansea in South Wales; Ayr and Troon in Scotland; Goole (and the Lower Ouse Improvement), Grimsby, Hull and Immingham on the Humberside; Barrow, Fleetwood, Garston and Silloth on the North West coast; King's Lynn, Lowestoft, Lydney, Plymouth (Millbury Docks) and Southampton]; (b) *British Waterways Board* [Ardrishaig, Ellesmere Port, Gloucester, Sharpness and Weston Point Docks (Runcorn)]; (c) *British Railroads Board* (Folkestone, Harwich —Train Ferry Terminal and Parkeston Quay—Heysham, Holyhead, Newhaven and Stranraer—East Pier).

2 'Statutory Trusts':
Includes Port of London Authority, Clyde Port Authority, Forth Ports Authority, Port of Tyne Authority and Tees and Hartlepool Port Authority.

3 'Local Authority Ports':
Includes Bristol, Preston, Portsmouth and Boston.

4 'Company Owned Ports':
Includes Liverpool, namely the Mersey Docks and Harbour Company; Manchester, owned by a public company, the Manchester Ship Canal Company, on the board of which Manchester Corporation has a majority by statute; Felixstowe, owned and operated by the Felixstowe Dock and Railway Company, incorporated in 1875.

It was understandable that in a situation like this a need was felt for coordination.

With a view to improving the ports and especially their efficiency, the National Ports Council was set up under the Harbours Act, 1964 as an advisory body to the Secretary of State for the Environment regarding 'the taking of action to secure the improvement, maintenance and management of harbours in Great Britain in an efficient and economical manner and the provision of adequate means of access to harbours by road and rail'.

The Council has the following specific advisory tasks: (a) applications, with regard to harbour investments of more than one million sterling; (b) loans to harbours by the Secretary of State; (c) grants to harbours on behalf of the Secretary of State; (d) amendments to powers of the harbour authorities, modifications of their constitutions, reorganizations in order to merge groups of harbours,

Differences in methods, structures and administration of ports provide the ingredients for a colorful European port mosaic.

etc.; (e) prescribing of form and substance of the harbour authorities' accounts.

Efforts are being made towards the merger of ports situated in the same river estuary. The Council also has a say in the matter of duties payable for the use of infrastructure, which are levied on ships, passengers and goods. Moreover, the Council has certain powers regarding the licensing of port employers under the Docks and Harbours Act, 1966.

It is evident from the above that in the United Kingdom too, the conditions for active port development have been created. A spectacular example is the Maplin Sands Plan, where the authorities want to create both a deep-sea harbour area and an international airport.

Netherlands

The Eighty Years War against Spanish rule began in 1568 and ended in 1648 with the Peace of Munster. However, already in 1588 one could actually speak of the independent *Republic* of the United Netherlands under the administration of the States-General. The *Kingdom* of the Netherlands dates from 1814. In this historical pattern the decentralization idea is much older than the centralization concept. Consequently, in such a country one would rather expect local instead of central port administration. Various ports, including the important ports of Rotterdam and Amsterdam, were administered as municipal ports. Where sufficiently strong municipalities are lacking, steps have been taken recently in a few instances (Delfzijl, Terneuzen and Flushing-East) to establish so-called 'Havenschappen' (Harbour Boards), in which the State plays a major role, although the province and municipality or municipalities concerned are also represented. In addition to the municipal ports and the so-called 'Havenschappen' there are a few exceptional forms of port administration in Holland, such as the *Staatsvisserijhaven Ijmuiden* (state fishery port) and the privately owned port of Vlaardingen-Oost (Vlaardingen East).

Among these ports, Rotterdam-Europoort holds a special position in two respects:
(1) The Municipal Port of Rotterdam is operationally an authority entirely separate from the Municipality of Rotterdam. This means, among other things, that the Municipal Port of Rotterdam is independent as regards its exploitation, which implies that any operational losses must be borne by the Municipal Port of Rotterdam itself and that it cannot rely on contributions from municipal funds.
(2) In Rotterdam-Europoort there is a strict division of tasks between the Municipal Port of Rotterdam and trade and industry. The municipal port develops the basic port infrastructure and makes this available to private companies (normally on the basis of long-term lease). Private trade and industry supply the suprastructure and, where necessary, complements the available infrastructure, for example, by constructing finger piers, pipelines, roads on leased sites, etc. Furthermore, private trade and industry see to the goods handling. The municipality does not contribute to, or participate in transhipment or other facilities created by private trade and industry. Also the State has never made any contribution or subsidy to industrial or other private firms in Rotterdam-Europoort.

The second largest port—Amsterdam—is also a municipal port, so that its exploitation is to some extent comparable to that of the port of Rotterdam. One distinct difference is, however, that the exploitation of the port of Amsterdam is not so precisely separated from other municipal operations, as is the case in Rotterdam. Until recently it was the large municipalities in particular which provided the impetus for port development. This was clearly the case in Rotterdam-Europoort which has been developed into the largest port in the world. In this connection it can be said that the Municipality of Rotterdam was aware of the importance of an integrated seaport-industrial development at an early stage. Meanwhile, the State has also acted as a booster within the framework of a national port and industrial distribution via the so-called 'Havenschappen.'

A Government Seaports Report was published in 1966. It proposed, among other things, the setting up of a consultative body which could lay the foundation for better coordination and cooperation between the individual Dutch seaports, considered by the Government to be necessary.

This desire was given shape on December 18, 1968, by the installation of the Seaports Consultative Committee by the Minister of Transport and Waterways at that time. In his inauguration speech the Minister emphasized that the Government wanted to place foremost the autonomy of the port administration as the basis for a sound ports policy. The activities of the individual autonomous bodies in the field of port administration should, however, be better attuned to each other.

A civil servant cannot be called to the chair of the Committee. Its members include representatives of the Government, the port administration and trade and industry (including employers organizations and trade unions). The Committee has 36 members.

The aims of the Committee are the following:
giving advice, whether requested or not, to the Government concerning seaport policy; and consultations to promote contacts among the port administrations, and between the port managers and trade and industry.

The Seaports Consultative Committee has so far been active mainly in the fact-finding field, for which it has set up a number of subcommittees. Moreover, there are Government-level contacts on seaport questions with Belgium within the framework of the Benelux Treaty.

Belgium

The history of Belgium is rather complicated, being connected with dynasties such as the Houses of Burgundy and, later, Habsburg, in particular its Spanish branch (Philip II). With the Peace of Utrecht in 1713 Belgium's destiny was linked to that of Austria, while the country was united with France from 1795-1815 and with the Kingdom of the Netherlands from 1815-1830. The Kingdom of Belgium dates from 1830-31, so that Belgium belongs to the relatively 'young states' in Europe.

In Belgium, municipal port administration is the most

usual and is found, for example, in Antwerp, Ghent and Ostend. Zeebrugge is administered and exploited by a company in which the State, the Municipality and trade and industry participate each for about one-third. Following in the footsteps of Holland, apparently Belgium has also thought of the 'Havenschappen' form of administration. This concept is mentioned in connection with the port extensions on the left bank of the River Scheldt, outside Antwerp territory. There are those who feel that the managerial complications arising from these extensions can be solved by means of a 'Havenschap' were it not for the fact that the Municipality of Antwerp has objections against this solution.

With regard to the municipal ports the results of the port operations are transferred each year to the municipal accounts. In the case of Zeebrugge, the losses are borne by the State, while any profit is shared on a 50-50 basis between the State and the company. The losses borne by the State, however, have to be repaid from subsequent profits.

In Belgium too, there are institutionalized consultations on a national level. This takes place through a commission, comprised of Government departments and port administrations. If we take Antwerp as an example, it can be concluded as far as Belgium is concerned that the local port administration has shown itself to be very active in port development and that the State has given active financial support to the development of port infrastructure and suprastructure. For this the State has used long-term plans (originally 10 and later five).

Federal German Republic

Germany likewise has a very complicated history. It actually became one country only with the unification of the South and North German States in 1870; after which the King of Prussia was proclaimed Emperor of Germany in 1871. Therefore, Germany too, must be reckoned among the so-called 'young states'.

Originally a confederation and now a federal state, Germany may be expected to have a decentralized port administration. The federal states (Lander) play an important role in port administration. The City States of Hamburg and Bremen are well-known for their pioneering role in port development. This does not mean that the Central Government (Bonn) plays only a nominal part. On the contrary, the Central Government provides strong support, both with regard to links between the ports and the sea (e.g. the deepening of the River Jade) and links between the ports and the hinterland (e.g. the construction of the Elbe-Seiten Canal), as well as regards promotion of transport between the ports and the hinterland (e.g. exceptional and 'as if' rates of the railways and, in general, the so-called Leber transport policy).

Yet it must be stressed that the local administrations of the ports, and certainly in the case of Hamburg and Bremen, have a very large measure of independence. Port policy is characterized by a high degree of local activity. In the two ports mentioned, the port management is also integrated into the total administration of the City, including port exploitation.

London's Tilbury Docks.

Belgium's Port of Antwerp.

The Federal States have considerable sources of income of their own and are, consequently, able to realize and finance port infrastructure and suprastructure independently. Moreover, it is possible for a Federal State to participate in a basically private industrial establishment.

The stimulating effect of the Federal State in port development, is, therefore, unmistakable. In addition, the Federal Government (Bonn) is prepared to contribute to the cost of improving navigation channels (e.g. Jade—Wilhelmshaven, Elbe—Hamburg, Weser—Bremen) and the related maintenance costs. Wilhelmshaven in particular has profited from this situation; its industrial sites have become attractive precisely by their location on deep water created by Bonn. Additionally, the large tankers, which only use Federal Government channels, are not required to pay harbour dues in Wilhelmshaven. Therefore, the Federal Government should also be regarded as a stimulator for national seaport development.

Lastly, it is mentioned that the 'Free and Hanseatic City of Hamburg' owns a large part of the port sites which can be used for the storage and transhipment of goods. The City State has ceded by contract to the 'Hamburger Hafen- und Lagerhaus Aktiengesellschaft' (HHLA), of which it is the only shareholder, all the transhipment sites in the free port, including the installations it has provided there. The HHLA itself owns only a few transhipment installations. On the other hand it owns most of the warehouses and storages sites. The HHLA operates the major part of the transhipment installations which it has for lease. The remaining installations are rented to private companies. Furthermore, it has leased out sites on which private firms operate their own installations. Private firms handle about 40 percent of the transhipment of general cargo on the quayside and the HHLA 60 percent. Until 1970, the HHLA was given relatively far-reaching tasks in the field of port policy. But with a view to attracting more private capital for transhipment activities and to acquire higher productivity in transhipment through keener competition, similar competition terms have been created for the HHLA and private quayside firms. A similar reorganization took place in Bremen in 1963. Bremen possesses the 'Bremer Lagerhaus-Gesellschaft', a joint stock company in which the City State participates for 51 percent.

In Emden, the storage and transhipment of ores, coal and other bulk goods is handled by a public enterprise, the 'Emder Hafenumschlagsgesellschaft'. The transhipment of other goods (oil, general cargo, grain) is handled by private firms.

Italy

The history of this country, from the Roman Empire to the attainment of the modern unitary state, is very complicated. Italy may be regarded as a unitary state since 1861, when Victor Emmanuel was proclaimed King of Italy. Seen in this light Italy is one of the so-called 'young states'. By virtue of its history one would expect in Italy both centralistic and decentralistic tendencies in port administration. Yet, under the influence of contem-

porary history, in particular, the centralistic trends predominate. State influence, for that matter, is evident throughout trade and industry. With regard to port policy there are certain parallels with the situation in France. In Italy too, port policy is integrated into national economic planning.

Consequently, the financial independence in the field of infrastructure investments of the local port administration is very restricted. A comparison with the situation in France is obvious in this respect. Italian ports are managed either by the State or by a local autonomous organization, called *'ente autonome'*. The following ports are subjected to this system of autonomy: Genoa, Savona, Civitavecchia, Naples, Palermo, Venice and Trieste. In Genoa they call it *'Consorzio Autonome'*. Represented in an *'Ente Autonome'* are: the State, the provinces and municipalities concerned as well as the employers organizations and trade unions. In Genoa, the chamber of commerce is also represented in the organization. 'Municipalities concerned' may also include more distant municipalities. Turin, for example, is represented in both the 'Ente Autonome del porto di Savona' and the Genoese 'Consorzio Autonome'.

The airport of Genoa—Sentri (which is situated within the port area)—also comes under the control of the 'Consorzio Autonome'.

In the ports under direct State management the harbormaster regulates and controls shipping, supervises port labor and grants concessions to port industries.

Finally it is noted that a committee of the Italian ports is discussing the establishment of a national port policy. There are also consultations between a number of Italian, Spanish and French Mediterranean ports.

Efforts toward a Common Seaports Policy

It is clear from the foregoing that various EEC organizations have made attempts in recent years to lay some foundations for a Common Seaports Policy. The colorful mosaic displayed by the Community seaports, however, shows that it will certainly not be easy to find uniform starting-points for a Common Seaports Policy which will be acceptable to all the member states concerned. An additional difficulty is that the seaports problem is interrelated with a large number of other problems, such as industrialization, energy, social harmonization, regional development, etc., which also require a Community solution. Furthermore, only few concrete results have been reached in the field of a Common inland transport policy, while absolutely nothing has been done so far about a Common Shipping Policy. Since these policies in particular are directly related to those of the seaports, there is hardly any foundation to provide even a minimal commencement of a Common Seaports Policy with a firm footing. On the other hand, it may well be that a commencement of a Common Seaports Policy could also serve as a skeleton for related Common policies. Such a skeleton might indeed be an important contribution toward the formation of the generally related EEC policies.

The results achieved so far in the development of a Common Seaports Policy are not encouraging, however.

This rather disappointing experience of the EEC organizations is no doubt largely a result of fears among the port administrators that 'Brussels' will opt for starting-points which are unacceptable to them. On the other hand, 'Brussels', not wanting to 'tread on the toes' of the port administrators needlessly, is hardly concrete in stating possible starting-points, which again strengthens the fears of the port administrators of being suddenly confronted with unpleasant surprises.

The picture of the vicious circle is evident. In order to break this impasse the EEC Commission made the undoubtedly useful suggestion during talks with ports representatives on November 21, 1972, to set up a small working group with the task of drawing up a list of problems

West Germany's offshore port at Wilhelmshaven.

Rotterdam's Europort.

for study. After analysis of these problems an attempt should be made to reach a certain synthesis. The results could then be discussed with all interested parties in the seaports. Only then will the EEC Commission develop further initiatives. It cannot be denied that the Commission has shown readiness to adopt a flexible attitude. At the same time, however, the Commission has made it clear that it will in any event continue to concern itself with a Common Seaports Policy, which it is authorized to do on the grounds of two articles in the EEC Treaty, namely,

Art. 80:

prohibiting charges and conditions, in respect of transport, involving any element of support or protection in the interest of one or more particular commercial undertakings or industries.

Art. 92:

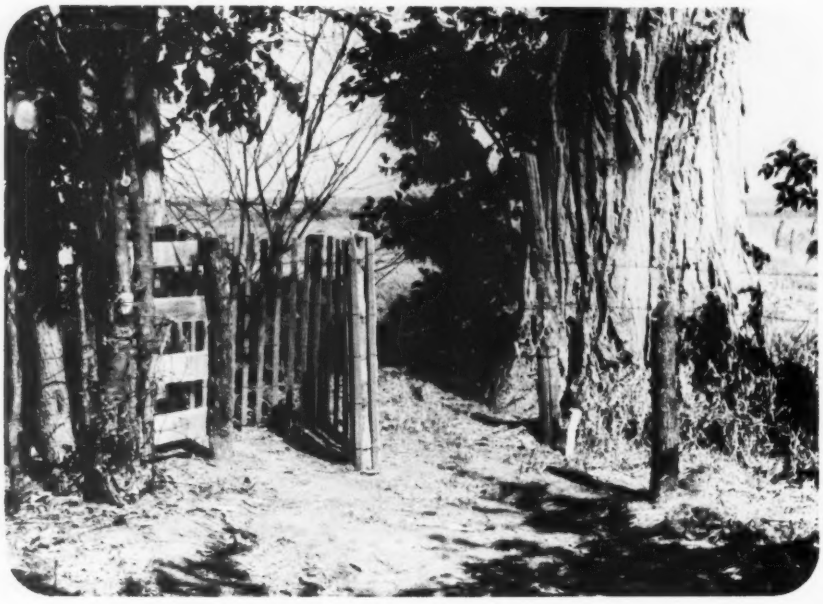
declaring aids granted by States incompatible with the Common Market.

Perhaps it will appear already in the first six months of 1973 whether or not the recent 'move' by the EEC Commission presents a new 'opening' for the next game on the 'EEC chess-board'. ■

by L. R. Quinlan Director, Kansas Landscape Arboretum

ar-bo-re-tums
for recreation and education

"Increased interest in the arboretum stems, in large part, from the great expansion in suburban living, which, in turn, has created a new appreciation of landscape beauty." *Leon C. Snyder, Director, Minnesota Landscape Arboretum*



Expanding interest in our natural environment has led to a rebirth of popular awareness in the use of the *arboretum* as a unique mixture of recreation and outdoors education for a specific geographic region.

The best way to define an arboretum is a place where trees, shrubs and other woody plants are cultivated for scientific or educational purposes. In a *landscape* arboretum, to be specific, only plants that have special landscape value are added, so that the design is naturalistic. The only deviation from nature comes from utilitarian features such as the approach road, parking areas, shelters, information signs, plant labels and footpaths.

A handful of us talked about such an idea for a full 40 years before we learned it was possible that the Federal Government might become a willing partner to such an undertaking. What truly made our plans feasible was the completion of a Corps of Engineers project that created Milford Lake as a new recreation area along the Republican River of northeastern Kansas. A nucleus of interested persons incorporated into the Kansas Landscape Arboretum on January 28, 1969 under sponsorship of the

Among the Kansas wildflowers recently cataloged in the arboretum are the blue wild indigo (left) and cobaea beardtongue (below left).

Below—One of the sights along the Nature Trail is the work of a beaver.

Opposite— This 53-inch diameter cottonwood starts the Nature Trail.

A 43-inch diameter American elm dwarfs a Nature Trail guide.

Kansas State Horticultural Society—an organization of garden clubs, landscape architects and affiliated horticultural groups.

The arboretum itself became a reality on January 1, 1972, when a lease was signed with the Corps for 193 fertile acres along the west shore of young Milford Lake about one mile south of the city of Wakefield.

Included in the lease are nearly eight acres of natural woodlands already containing 22 species of trees and shrubs. The remainder, part of an old farmstead, consists of formerly cultivated ground and a cover of prairie grasses native to the area.

Using the old farm house as headquarters, the arboretum's officers converted the hog house into a work shop and utilized the two large barns and the implement shed for storage of supplies and equipment. One of the barns has possibilities for being developed into a nature center. There are also plans to use the silo as a lookout tower, since it offers a splendid view of the nearby arboretum and almost half the 20-mile long Milford Lake.

Eventually the main arboretum will consist of 150 acres of trees and shrubs with twin specimens of each shrub specie and triple specimens of each tree clone or species. More than 200 woody plants were put into the ground this spring, informally arranged to resemble naturalistic looking wooded areas separated by open meadows.

This emphasis on naturalness is reinforced by placing trees with unusual or highly colorful foliage and those with weeping and extremely conelike (fastigiate) forms in a special display section.

All special plantings will be kept a short walking distance from conveniently placed parking areas. To form a bird sanctuary, species of berry-producing shrubs and small trees will be planted near the farm pond and bird houses will be built. Eventually, the Minnie E. Schroeder Garden will be outfitted with all types of roses, but concentrating on the common perennials and annuals.

The first "green thumb project" was completed with the establishment of 19 stations along the almost mile long Nature Trail. Only plants native to Kansas have been added to the 24 trees and shrubs and wild flowers predating the planning of the trail. Each station on this trail marks one or more natural points of interest described in a mimeographed self-guide distributed to visitors prior to starting their trail hike. Human guides are also available for group hikes.

Probably most distinctive among the 19 stations is the 53.2 inch diameter (at breast height) cottonwood, our State tree, located near the head of the trail. Besides the cottonwood, several of the American elms in the area are over 40 inches in diameter.

Aside from the strictly horticultural sights to behold, visitors are cautioned to step quietly and search for evidences of beaver works and those of other animals, and to watch carefully for any of the 21 species of song birds previously observed along the trail. Planning is also underway for the blind, who will soon have a Touch-and-Tell Trail to please their other senses.

A touring group moves along the Nature Trail during a weekend visit at Milford Lake.

Of particular interest in the still new arboretum is the recently started memorial tree walk consisting of eight trees planted this spring in honor of a person or family. Each tree has an accompanying bronze plaque bearing the common and scientific names of that tree, the person(s) for whom the tree was planted, its donor and the year of planting. Each plaque is set in concrete, enhanced by a ground cover plant and protected against mower damage.

The manner in which the woody plants are displayed demonstrates the types of landscape planning visitors may adopt for their own homes. The various demonstrations show how plants can be used: to prevent water and wind erosion, to reduce ground surface evaporation, as windbreaks, to reduce noise, screen objectionable views and objects, enframe a good view, and other principles of good design. Future demonstration plots will include displays of ground covers, poisonous plants, native edible plants and others.

Supporting the burgeoning nature trail is a small nursery established near the farm house from gifts of plants donated by friends of the arboretum throughout Kansas. Other plants have been purchased by the use of funds collected through donations and membership dues from individuals and organizations.

Although the Corps has provided the leased land, and private donations support its daily operations, the arboretum hopes some day to be adopted by the State of Kansas or become part of some university sponsored research, education or extension service. The arboretum's board feels the Nature Trail and the future projects already planned can be instrumental in helping the citizenry of Kansas learn the simple ways all of us can improve our environment and gain the type of personal information that helps in creating more healthful and attractive home surroundings.■

Events, Deeds & Deliberations

Desert Water Search

Idaho's water planners are looking to the State's southern desert for new water.

Hidden under the sage-brush stubble and gnarled lava field that cover more than 10,000 square miles, lies a huge aquifer—a body of porous basalt fed water from surrounding mountain ranges and described by geologists as "one of the world's outstanding water bearing formations."

As much as 250 million-acre feet of water may be stored—about eight times the amount held in Lake Mead, the largest man-made lake in the United States.

Aquifer water is now used to irrigate about 640,000 acres of cropland, but most geologists say that its potential is far greater.

Proponents claim the aquifer offers these advantages over the building of new dams: it is already present, the stored water does not evaporate, its use does not require huge government projects, and much of the water used to irrigate crops on land above it percolates back to its source.

Scientists do not know exactly how much water the aquifer eventually could yield annually, but most believe that, if used in conjunction with the Snake River, its southern boundary, it could irrigate much new farmland, possibly cool nuclear power plants and attract water-using industries in the Idaho area.

New Recreation Brochures List Sites and Facilities

To aid the local fisherman as well as the touring camper, the Corps of Engineers has published a series of six regional recreation user brochures showing the location of Corps-built lakes and listing the recreation facilities available.

The color brochures feature a map of the region, a brief description of the projects in that region, and instructions on how to find them.

Over 300 projects, nearly all of which are lakes, are listed. All but the smallest lakes offer campgrounds, picnic areas, and boat launching ramps. Swimming is generally permitted, and fishing is encouraged. In the more northern locales, ice fishing is a popular sport. Hunting is permitted in season. Additional attractions are hiking and birdwatching, since the lakes are big attractions for waterfowl.

Facilities are generally operated by the Corps, but many State and local agencies lease project land for their own management and frequently provide specialized facilities such as guest lodges, golf courses, and tennis courts. In terms of attendance the total operation represents the largest recreation program in the country, with 323 million visitor-days recorded last year.

The brochures are available free at Corps projects or from any District or Division Office.

Soviets Launch New Service

The Soviet Union has established a national Hydrometeorological Service combining the functions of a weather bureau and a water resources management agency to monitor and control air, soil and water pollution levels. The decree that established the service makes no reference, however, to any power of enforcement on standards for environmental quality.

It also indicated that no new environmental superagency responsible for the entire pollution problem—from research through monitoring to enforcement—will be created. The individual government ministries and agencies are still charged with responsibility for pollution abatement in their own areas.

A national research program in pollution sources and control techniques is established, however, and it will be supervised by the State Committee of Science and Technology.

Corps Rehouses Three Units

Three civil works elements of the Corps of Engineers, formerly scattered around the Washington, D.C. area, will be able to coordinate more easily now that they have been moved into the Corps' new Kingman Building at Fort Belvoir, Va.

The $3,700,000 facility, started early in 1971, brings the *Board of Engineers for Rivers and Harbors,* the

Coastal Engineering Research Center and the *Institute for Water Resources* under one roof. Housing 260 employees in 76,000 square feet, the new building provides ample research, evaluation and planning space for future civil works projects.

The oldest of these scientific-engineering tenants is the Board of Engineers for Rivers and Harbors, which has been reviewing and preparing planning reports and making recommendations for proposed improvements in the development of water resources for 71 years.

The Coastal Engineering Research Center was created in 1963 as the Beach Erosion Board. It serves as the research and development agency of the Corps in the field of coastal engineering, which covers prevention and control of erosion on coastal, lake and waterway shorelines.

The Institute for Water Resources was established four years ago. It initiates and monitors research for the Corps in all phases of comprehensive planning for water resources. These include environmental quality, regional development and interregional planning aspects.

The Kingman building bears the name of Brigadier General John J. Kingman, who once served as a senior member of the old Beach Erosion Board and the Board of Engineers for Rivers and Harbors, and as the Assistant Chief of Engineers.

New Range of Rangers

Visitors to Corps recreation sites had the pleasure of finding several female park rangers this summer.

Employed as park rangers these young women wore name tags similar to their male counterparts.

While some were employed for the summer only, several will become permanent employees at various Corps sites. In making the selections for its first women park rangers the Corps looked for college students majoring in the physical or natural sciences.

Highest of Its Kind

Recently dedicated Dworshak Dam is unequaled in height among concrete gravity dams built on a straight axis in the Western Hemisphere. Its 717-foot height from bedrock to crest also makes it third highest among all concrete dams in the U.S. Located near Orofino, Idaho, on the North Fork of the Clearwater River, Dworshak is the newest addition to the Columbia-Snake River system of multi-purpose dams in the Pacific Northwest.

Corps Parks Look for Local Sponsors

Local governments and businessmen are being offered larger roles in running recreation areas at Corps projects. Beginning in July of this year the extent of development at new recreation sites will be determined by the amount of local sponsorship that a project receives.

The Federal Water Project Recreation Act of 1965 added recreation to the uses of multi-purpose projects with the requirement that non-Federal sponsors share 50 percent of recreational development costs. Following passage of the act, a policy of gradual local participation was encouraged at older project sites. The new policy put into effect this July extends the principle of local participation to all new park areas at Corps projects.

While the Corps will continue to operate those areas already developed for recreation, it will also offer inducements to potential local sponsors who might be interested in investing in these older areas.

Principles and Standards

Four major decisions accompanied President Nixon's approval of the new *Principles and Standards for Planning Water and Related Land Resources* submitted to his office by the U.S. Water Resources Council. Since official publication of the Principles and Standards occurred at WATER SPECTRUM press time, a full discussion of their significance will appear in a subsequent issue.

The forthcoming detailed discussion by a member of the Water Resources Council will focus on four major revisions to the *Proposed Principles and Standards* published in the Federal Register in December 1971.

The first change narrows concentration of national planning objectives from three to two: *national economic development* and *environmental quality*. These objectives will guide future formulation of alternative plans for use of water resources.

The second decision changes the rationale for determining the *discount rate* to be used in planning studies. The rate is to be consistent with the cost of Federal Government borrowing, and reflects the assumption that the Government's investment decisions are related to the cost of money to the Government.

Third, the so-called "grandfather clause" will permit *retroactive application* of these Principles and Standards to all currently authorized but unfunded projects. The decision to apply them to a given project will rest with the head of each Federal agency engaged in water resources planning.

If it appears that applying these Principles and Standards retroactively should substantially alter any currently authorized plan or project there is a possibility that the plan or project would be submitted to Congress again for reauthorization. Also, separable elements of any plan or project may now be given an independent review prior to releasing funding for actual construction.

Fourth, *four separate accounts* will be retained for displaying the beneficial and adverse effects of each plan. Two of these match the objectives retained as a result of the first decision discussed above. The other two accounts are labelled *regional development* and *social well-being,* and will be used to display these other effects for each plan.

(The New Chief—continued from inside front cover.)

others concentrated on noise abatement and other forms of pollution control.

For future civil works programs, now part of his new responsibilities, he is particularly interested in seeing an expanded use of the Corps inventories of places and objects having a high environmental value.

At the same time, he emphasizes that it would not be good for the Corps to become overly specialized in any specific area—whether in the environmental aspects of wastewater recycling and stream pollution control or in data assimilation or any other limited area of technology. Rather, he feels that it behooves the Corps to be equally attentive to problems that affect *every* water user, to be comprehensive in its resource management duties.

In that respect, General Gribble believes that the underlying need in areas of highly advanced technology is to determine which of certain related elements are not keeping pace with the others and to bring these up to a level necessary for efficient use. For example, he thinks the highly sophisticated systems of data collection associated with electronics and optics should now be matched with a better capability for interpretation of the data.

He held similar management views in the mid-60s when he was Division Engineer for the North Central Division. Then, using guidelines furnished by the Office of the Chief, he carried out comprehensive planning for those river basins and parts of the Great Lakes that were in his Division. One problem at that time, incidentally, was the low state of the lake levels as opposed to the current problem with overly high levels.

From accounts of some who worked for him when he was Division Engineer, he provides the type of direction that makes every person in the organization know that his or her work is important. He is well acquainted with day to day chores required in field operations, having previously served as District Engineer in Alaska where he directed projects on harbor development for small craft, an inventory of hydroelectric potential, flood control, channel straightening and various other civil works.

One of his much earlier assignments was as Company Commander of a component unit of the 340th Engineers during construction of the Alaskan Highway. He then became Executive Officer of the 340th during the New Guinea and Luzon campaigns in World War II; and later during the Luzon campaign he was assigned to the 43rd Infantry Division as Commanding Officer of the 118th Engineer Battalion.

During another period of his career he served as Metallurgical Engineer with the Los Alamos Scientific Laboratory in New Mexico. Later, in another assignment, he was presented the Legion of Merit for developing the technical specifications for the Army's first nuclear power plant.

As Chief of Engineers he is the principal advisor to the Army Chief of Staff on all military engineering matters, and in that capacity directs a $1.5 billion annual construction program for the Army, Air Force, and other government agencies. The Civil Works planning and construction program which he also directs is funded at a similar level.

He has attended various schools of advanced education during his career, including the University of Chicago, where he received a master of science degree in Physical Science. He has an honorary doctorate in Engineering from Michigan Tech, and is a graduate of the Army Command and General Staff College, Fort Leavenworth, Kansas, and the National War College at Washington, D.C.

He is the 43rd Chief of Engineers.

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Another Kansas wildflower at the arboretum is the long-headed cornflower. *See page 36.*